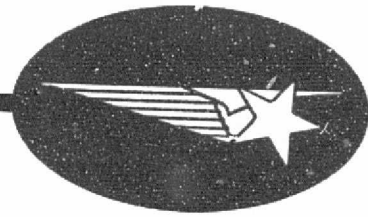


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EXHAUST AND LOCAL MACH NUMBER EFFECTS ON THE
SOLID ROCKET BOOSTER (SRB) BASE PRESSURES
(FA19) Final Report (Lockheed Missiles and
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HUNTSVILLE RESEARCH & ENGINEERING CENTER

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INVESTIGATION OF JET EXHAUST
AND LOCAL MACH NUMBER
EFFECTS ON THE SOLID
ROCKET BOOSTER (SRB)
BASE PRESSURES
(FA19)

FINAL REPORT

January 1978

Contract NAS8-29752

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FOREWORD

This report presents the results of a plume technology wind tunnel test in the NASA-MSFC 14 x 14-Inch Trisonic Wind Tunnel. The test was conducted by personnel of the Lockheed-Huntsville Research & Engineering Center for the Systems Dynamics Laboratory of the Marshall Space Flight Center under Contract NAS8-29752. The MSFC technical monitor for this study is Mr. Kenneth L. Blackwell, ED-32.

SUMMARY

As part of the NASA-MSFC Space Shuttle plume technology study, an experimental aerodynamic investigation was conducted to supplement the existing data base with data as a function of both local and freestream Mach number.

The test was conducted in the Marshall Space Flight Center's 14 x 14-inch trisonic wind tunnel using a strut-mounted cone-cylinder-flare SRB type model. Two single nozzles of area ratios 5.0 and 8.0 were tested along with two flare angles of 10 and 20 degrees.

To meet the objective of obtaining data as a function of local Mach number, flare angles of 10 and 20 degrees were tested at Mach numbers of 0.5, 0.9, 1.2, 1.46, 1.96 and 3.48 in the presence of gaseous plumes. An attempt was made to determine the local Mach number above the flare by utilizing a pitot probe. This objective was only partially satisfied because the 20 degree flare separated the flow ahead of the flare for Mach numbers of 0.5 to 1.96. An accurate local Mach number could not be determined because of the separated flow.

To meet the objective of a data base as a function of freestream Mach number, model surface and base pressures were obtained in the presence of gaseous plumes for a matrix of chamber pressures and temperatures at Mach numbers of 0.5, 0.9, 1.2, 1.46, 1.96 and 3.48.

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Section 1 INTRODUCTION

NASA-MSFC is currently conducting a Space Shuttle plume technology study to determine the parameters pertinent to simulating Space Shuttle engine plume-induced effects on aerodynamic characteristics in the wind tunnel using air and CF_4 as the simulant gas, and to gain a better understanding of the plume gasdynamic parameters which govern the plume-flowfield interaction.

As a part of the overall program, a test was conducted in the MSFC 14 x 14-Inch Trisonic Wind Tunnel to provide a data base which is a function of both local and freestream Mach number. This data base may be used to refine Mach number correlation techniques.

The test program consisted primarily of generating single nozzle exhaust flow to investigate plume induced effects on afterbody and base pressures for various flared base configurations.

The basic model for this investigation consisted of a strut-mounted cone-cylinder body with two interchangeable flared bases and two interchangeable conical nozzles. The MSFC heater and gas supply system was utilized to supply air and CF_4 to the model plenum chamber. Chamber pressures were varied from 0 to 1800 psia and a chamber temperature of 500 F. Model surface pressures, local base Mach numbers, and nozzle performance data were obtained at freestream Mach numbers of 0.5, 0.9, 1.2, 1.46, 1.96 and 3.48 for various chamber conditions at zero-degree angle of attack. Carborundum grit was placed 2 inches aft of the cone-cylinder juncture to ensure a turbulent boundary layer in the model.

Section 2

TEST APPARATUS

2.1 TEST FACILITY DESCRIPTION

The test program was conducted in the NASA-MSFC 14-inch trisonic wind tunnel. The facility is an intermittent trisonic blowdown tunnel which exhausts either to a vacuum system or to atmosphere. The tunnel is capable of producing Mach numbers from 0.2 to 2.5 by utilizing a transonic test section and Mach numbers from 2.74 to 4.96 with a supersonic test section. Reynolds numbers per foot of up to 18,000,000 may be obtained depending upon the test Mach number and tunnel limits. A more detailed description of the facility is presented in the tunnel technical handbook (Ref. 1).

2.2 HEATER DESCRIPTION

A high-pressure gas system capable of supplying gas heated to a temperature of 600 F and 2000 psia was used for this test program. The heater is capable of a gas flow rate of up to 4 lb/sec for a period of 10 sec. The system is designed with three high-pressure storage tanks fabricated from heavy wall tubing. The first tank in the series circuit (cold tank) is a 4.2 cu ft tank. Two pneumatically driven compressors pump low pressure gas as supplied by small cylinders or the facility air system to 4000 psia which is then stored in this tank. The maximum tank pressure is controlled by a relief valve set at 4300 psi and a 4600 psi rupture disk. The output of this vessel is pneumatically regulated and is used as the controlled supply for the second tank.

The second tank (hot tank) provides 6.9 cu ft of gas storage which can be electrically heated to supply the test requirements for jet exhaust simulation. The maximum pressure in the tank is controlled by a relief valve set at 2200 psi and a 2500 psi rupture disk. Maximum temperature of the clamp-on heaters is controlled by a 765 F sensing element.

To provide system flexibility and to prevent the loss of expensive gas, a 2.2 cu ft relief tank is provided. Gas can be removed from the hot tank and stored in the relief tank for later use if the hot tank is overcharged. The two compressors are also able to pump from the relief tank to the cold tank.

The output of the system is opened by pushing the CF_4 "discharge control valve" button. This activates the solenoid valve in the pneumatic circuit to move the actuator on a discharge valve. The discharge pressure of the system is controlled by setting a pressure with the "dome regulator control" prior to pushing the discharge button. Figure 1 is a summary schematic drawing of the heater.

A one-inch o.d. heated and insulated steel pipe was used to connect the heater to the model. The pipe was attached to the heater discharge valve and routed through the side of the tunnel, up through the tunnel floor and attached to the sting.

A more detailed description of the heater and its operating characteristics is presented in Ref. 2.

2.3 MODEL DESCRIPTION

The model, which is a scaled solid rocket booster, consists of a strut-mounted cone-cylinder body (Fig. 2) with two interchangeable flared bases and two interchangeable nozzles (Table 1). The model was designed by MSFC and fabricated by Micro-Craft, Inc., Tullahoma, Tenn. (Space Shuttle Plume Technology Model, Assembly Drawing No. 80M51432). The cone-cylinder model has a one-piece construction. The cylindrical afterbody is rigidly attached to the strut and is composed of the nozzle plenum chamber and the removable flared bases. The two interchangeable nozzles are attached to the afterbody at the aft bulkhead. Figure 3 shows the model installed in the wind tunnel.

Six static pressure orifices are located on each of the two flared bases. The model plenum chamber is equipped with a total pressure probe and a total temperature probe. The nozzles are designed with three internal static pressure orifices and three static base pressure orifices. The location and numbering system for all the pressure orifices are shown in Fig. 4. The nozzle tubes (1 through 6) and the flared base tubes (7 through 12) are routed internal to the model and strut. Both sets of tubes are hard tubing all the way from the model to outside the tunnel.

The nozzles and flared bases are attached directly to the afterbody and are independently interchangeable. A silicon "O" ring is required to seal the interface between the nozzle adapter and afterbody.

The model support consists of the strut, sting, and sting adapter (shown in Fig. 2). The strut and sting shown in Fig. 5 are used not only to support the model but also to supply the simulant gas to the model. The pressure tubing is routed through the trailing edge of the strut and along the upper surface of the sting.

A band of carborundum grit was positioned on the cylindrical afterbody to ensure the formation of a turbulent boundary layer. A preliminary experimental investigation determined the grit size should be No. 80 and should be placed 2 inches aft of the cone-cylinder juncture.

Also part of the test hardware was the device utilized to measure pitot pressures in the flow field above the flare. The device consisted of a probe support mounted on the sting adapter and a probe connected to the support. An installed view is shown in Fig. 6. Both the vertical and horizontal position of the probe could be varied. Three different slots were provided to hold the probe, each producing a different angular orientation between the probe and the flare.

All model static pressures, base pressures, nozzle pressures, model temperature and tunnel conditions were recorded by the Hewlett Packard 96 MX data system. All pressures were measured by individual transducers and these, along with the chromel alumel thermocouple output in the plenum chamber, were read by an electronic scanner. The output from the scanner was recorded by the data system for reduction.

Section 3

TEST PROCEDURE AND CONDITIONS

The test was conducted at Mach numbers of 0.5, 0.9, 1.2, 1.46, 1.96 and 3.48 with the model at a zero-degree angle of attack. Model chamber pressures ranged from 0 to 1800 psia and a chamber temperature of 500 F.

The test program was conducted in two parts:

● Part 1

In this part a grit study was performed to ensure the formation of a turbulent boundary layer. The grit type, grit location and tunnel operating conditions were varied as shown in Table 2. Shadowgraphs were taken during the investigation.

Also in this part the local Mach number probes were calibrated as shown in Table 3. Three probes as shown were tested at freestream Mach numbers of 0.5 and 1.96 to ensure proper operation.

● Part 2

This part of the test was performed in three phases: In phase 1 an attempt was made to determine the effect of local Mach number on plume angle. Local Mach number at the base was varied by utilizing ramp angles of 10 and 20 degrees. An external pitot probe was positioned, using the schlieren system, at the edge of the flare boundary layer and behind the flare shock. Since the positioning is critical to correct pressure readings, several runs were made at Mach numbers of 0.5 to 1.96 with the glass walls installed. Then the porous walls were installed and data taken with the probe positioned as previously determined. Supersonic runs of Mach 3.48 were also made using the schlieren system to correctly position the probe.

In the second phase, nozzles 31 and 33 (Table 4) were calibrated by blowing air through both of them and freon (CF_4) through nozzle 31 at selected chamber pressures, chamber temperature and test section static pressure. Nozzle static pressures, model static pressures, chamber pressure and test section static pressure were recorded for each test condition. Several frames of data and schlierens were taken.

After calibration of the nozzles, phase 3 was initiated. All of the nozzles were tested for the specified Mach numbers and a matrix of chamber conditions. During the non-quiescent phase, model surface and base static pressures, plenum chamber pressure and temperature, nozzle wall static pressures and test section conditions were recorded for each run.

Section 4 DATA ACCURACY

The estimated accuracy of the data is as follows:

● Tunnel Conditions		
Freestream total pressure		± 0.05 psia
Freestream static pressure		± 0.015 psia
● Model Surface and Base Pressures		
$M_{\infty} = 0.5, 0.9, 1.2, 1.46$ and 1.96		± 0.113 psid (15 psid transducers)
$M_{\infty} = 3.48$		± 0.0375 psia (5 psia transducers)
● Nozzle Wall Static Pressures		
Chamber pressure		
0 - 2000 psia		± 0.375 psia (50 psia transducers)
● Model Plenum Chamber Conditions		
Total and static pressure		
0 - 2000 psia		± 18.75 psia (2500 psia transducers)

Section 5

PRESENTATION AND DISCUSSION OF DATA

This section summarizes data collected during parts 1 and 2 of the test and presents results of the local Mach number investigation. A complete set of data from part 2 is shown in the appendix.

5.1 Part 1

During the grit study, the only data collected were shadowgraphs. These were used to determine the proper grit location and size to ensure turbulent flow. None of these are presented, but they are available.

The results of the local Mach number probe calibrations were pitot pressures which were reduced to Mach numbers utilizing Ref. 3. The Mach numbers were 0.5 and 1.96 as determined by the probes, which matched the actual tunnel Mach numbers. This verified proper operation of the probes.

5.2 Part 2

Results of the local Mach number investigation are summarized in Table 5. Reference 3 was used to reduce the pitot pressures to local Mach number. A complete run log and the resulting pitot pressures is shown in the appendix. The correct local Mach number occurred at the maximum pitot pressure reading. The position of the probe was usually outside of the boundary layer and just below the shock. Both schlierens and shadowgraphs were taken and are available.

The local Mach number investigation proved out the technique, but did not satisfy the objective of determining local Mach effect on plume induced aerodynamics. This is because at Mach numbers of 0.5 to 1.96 the 20 degree

flare causes the flow to separate (Fig. 7). Therefore, no correct local Mach number could be determined. Thus for these freestream Mach numbers plume induced aerodynamics as a function of local Mach number cannot be determined. A comparison is possible at $M = 3.48$ because the 20-degree flare flow was not separated.

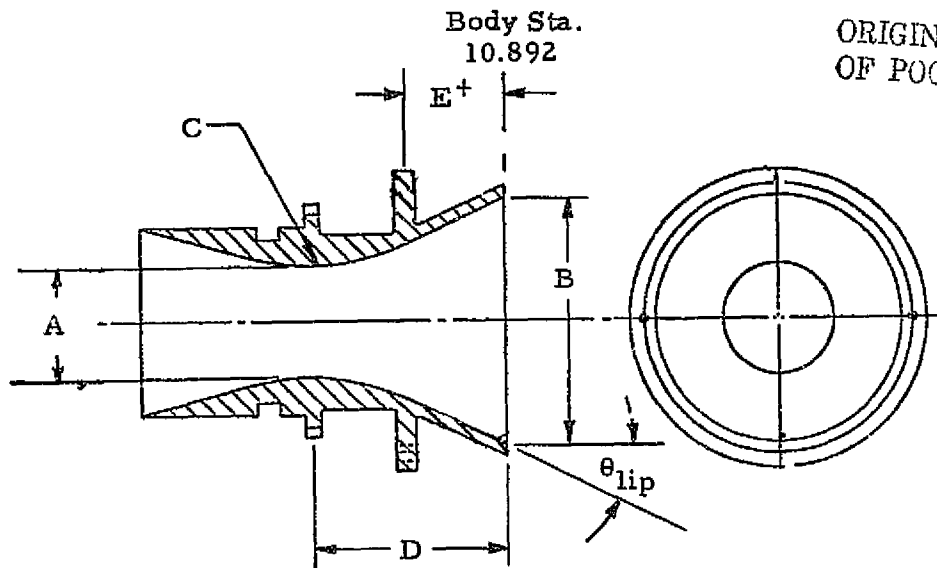
During the calibration phase nozzles 31 and 33 were calibrated as indicated in the calibration data summary (Table 4). Schlierens were taken for each calibration run and are available. Sample schlierens are shown in Fig. 8 for nozzle 33. Complete calibration results are shown in the Appendix.

The non-quiescent phase consisted of generating nozzle flow for both nozzles and a matrix of chamber conditions to investigate plume effects on base pressure at Mach numbers of 0.5, 0.9, 1.2, 1.46, 1.96 and 3.48. Table 6 summarizes nominal test conditions, and Table 7 is a detailed run log of the nonquiescent and calibration phase of the test program. The chamber temperature (T_c) shown in Table 7 is approximate for runs 11 through 66 because the thermocouple was broken. An approximate value of chamber temperature was obtained in the following manner. By utilizing runs 115, 116 and 117 a plot was made of T_c as a function of P_c . From this plot values of T_c were obtained for runs 11 through 66.

REFERENCES

1. Simon, Erwin, The George C. Marshall Space Flight Center's 14 x 14-Inch Trisomic Wind Tunnel Technical Handbook, NASA TM X-64624; November 1971.
2. Cooper, C. E., "Operating Instructions for the NASA-MSFC High-Temperature, High-Pressure Heater System," LMSC-HREC TM D390107, Lockheed Missiles & Space Company, Huntsville, Ala., March 1974.
3. Ames Research Staff, "Equations, Tables, and Charts for Compressible Flow," NACA TN 1135, Ames Aeronautical Laboratory, Moffett Field, Calif., 1953.

Table 1
MODEL NOZZLE GEOMETRY



Nozzle	A/A^*	θ_{lip} (deg)	A (in.)	B (in.)	C (in.)	D (in.)
31	(8.0)	(15) ⁺⁺	(.321)	(.909)	(.642)	(1.182)
	8.19	14.90	.317	.907	.600	1.186
33	(5.0)	(25)	(.407)	(.909)	(.813)	(.719)
	5.14	25.06	.402	.911	.711	.711

⁺ This dimension is a constant 0.34 in. for both nozzles.

⁺⁺ (Design Dimension) Actual Dimension.

A/A^* = exit plane area/throat area.

Table 2
GRIT STUDY

Run No.	Grit Location from Shoulder (in.)	Grit No.	$P_{T\infty}$ (psia)	M
7	0.5	180	28.0	1.96
8		150	28.0	↓
9		120	28.0	
19	1.0	No Grit	18.0	0.5
10		"	28.0	1.96
18		100	18.0	0.5
11		100	28.0	1.96
17	2.0	80	18.0	0.5
12		80	28.0	1.96
16		100	18.0	0.5
13		100	28.0	1.96
15	↓	80	18.0	1.96
14		80	28.0	1.96

Table 3
PITOT PROBE CALIBRATION

Run No.	Probe No.	P_{T_∞} (psia)	M
1/0	1	18.0	0.50
2/0	2	18.0	↓
3/0	3	18.0	↓
4/0	1	28.0	1.96
5/0	2	28.0	↓
6/0	3	28.0	↓

Table 4
CALIBRATION RUNS

Run No.	P_c (psia)	T_c (F)	Gas	Nozzle Description
113/0	400	500	CF ₄	Nozzle 31 $A/A^* = 8.0$, $\theta_{lip} = 15^\circ$
112/0	1200	↓	↓	↓
114/1	1550	↓	↓	↓
117/0	400	↓	Air	↓
116/0	1200	↓	↓	↓
115/1	1550	↓	↓	↓
37/0	400	↓	↓	Nozzle 33 $A/A^* = 5.0$, $\theta_{lip} = 25^\circ$
36/0	800	↓	↓	↓
35/0	1300	↓	↓	↓

Table 5
LOCAL MACH NUMBER RESULTS

Configuration	M_{∞}	P_{∞} (psia)	$P_{T_{\infty}}$ (psia)	T_c (F)	P_c (psia)	Flare Local Mach No.
Nozzle 33	3.48	0.67	49.96	—	—	2.20
Flare = 20°	3.48	0.67	50.01	445.0	988.4	2.19
Flare = 10°	3.48	0.67	50.01	—	—	2.98
	3.48	0.67	50.01	445.0	1001.9	2.96
	0.50	15.23	18.07	—	—	0.54
	0.50	15.25	18.09	445.0	1002.3	0.50
	0.90	10.69	18.07	—	—	0.90
	0.90	10.67	18.06	445.0	999.4	0.82
	1.20	7.48	18.07	—	—	1.07
	1.20	7.52	18.07	445.0	994.6	1.06
	1.46	5.77	20.05	—	—	1.27
	1.46	5.75	20.05	445.0	1001.9	1.27
	1.96	3.83	28.04	—	—	1.69
	1.96	3.83	28.05	445.0	1003.1	1.69

Table 6
NONQUIESCENT RUN NUMBER SUMMARY

Air Nozzle 33 $A/A^* = 5.0$, $\theta_{lip} = 25^\circ$ Flare = 20°							
P_c (psia)	T_c ($^\circ F$)	Mach Number					
		.5	.9	1.2	1.46	1.96	3.48
—	—	27/9	23/9	19/9	15/9		31/8
212	500						34/0
222						11/1	
251					18/0		
275				19/0			
329			26/0				
375		27/0					
396						12/0	
423				20/0			
427					17/0		
440			25/0				
461		28/0					
496							33/1
591		29/0					
646			24/1				
681						13/0	
727				21/0			
749		30/0					
788					16/0		
893			23/0				
1039							31/1
1119				22/0			
1300					15/0	14/0	32/1

Table 6 (Continued)

CF_4 Nozzle 31 $A/A^* = 8.0$, $\theta_{\text{lip}} = 15^\circ$ $\text{Flare} = 10^\circ$						
P_c (psia)	T_c ($^\circ\text{F}$)	Mach Number				
		.5	.9	1.2	1.96	3.48
212	500 ↓					108/1
448						109/0
434						91/0
450					92/0	
468				96/0		
631			103/0			
681				97/0		
689					93/0	
716						88/2
763		104/0				
793			102/0			
816						110/0
894		105/0				
1005				98/0		
1043			101/0			
1090					94/1	
1110		106/0				
1142						89/1
1300		107/0				
1341			100/0			
1377				99/1		
1402						111/0
1550					95/0	90/0

Table 6 (Concluded)

Air Nozzle 33 $A/A^* = 5.0$, $\theta_{lip} = 25^\circ$ Flare = 10°							
P_c (psia)	T_c ($^\circ F$)	Mach Number					
		.5	.9	1.2	1.46	1.96	3.48
—	—	47/9	51/9	55/9	59/6	63/8	46/9
212	500						46/0
222							
251					62/0		
275				58/0			
329			51/0				
375		50/0					
396						64/0	
423				57/0			
427					61/0		
440			52/0				
461		49/0					
496							45/0
591		48/0					
646			53/0				
681						65/0	
727				56/0			
749		47/0					
788					60/0		
893			54/0				
1039							44/0
1119				55/0			
1300					59/0	66/0	43/0

Table 7
RUN LOG

Run No.	Nozzle Configuration	M_∞	P_∞ (psia)	P_{T_∞} (psia)	T_c ($^{\circ}\text{F}$)	P_c (psia)	Comments
11	Nozzle 33	1.96	3.83	28.06	330.0	220.3	Transonic Test Section Porous Walls Installed
12	Air	1.96	3.78	28.04	360.0	390.2	
13	$A/A^* = 5.0$	1.96	3.70	28.05	410.0	657.1	
14	$\theta_{lip} = 25^{\circ}$	1.96	3.81	28.04	470.0	129.7	Jet Off
15/9	Flare = 20°	1.46	5.74	20.02	—	—	
15		1.46	5.77	20.02	475.0	1326.8	
16		1.44	5.73	20.03	425.0	791.5	Jet Off
17		1.47	5.73	20.02	370.0	438.6	
18		1.45	5.76	20.03	335.0	252.0	
19/9		1.21	7.31	18.00	—	—	Jet Off
19		1.19	7.41	18.02	340.0	273.1	
20		1.21	7.47	18.04	370.0	420.0	
21		1.19	7.41	18.05	415.0	708.9	Jet Off
22		1.23	7.44	18.07	455.7	1097.6	
23/9		0.88	10.88	18.08	—	—	
23		0.88	10.84	18.08	445.0	917.8	Jet Off
24		0.91	10.60	18.03	405.0	651.0	
25		0.93	10.57	18.03	370.0	443.1	
26		0.92	10.59	18.03	350.0	330.0	Jet Off
27/9		0.51	15.11	18.02	—	—	
27		0.53	15.08	18.02	335.0	364.8	
28		0.53	15.10	18.02	375.0	460.8	Jet Off
29		0.51	15.11	18.02	395.0	572.9	
30		0.52	15.12	18.02	420.0	744.5	
31/8		3.48	0.67	49.87	—	—	Jet Off

Table 7 (Continued)

Run No.	Nozzle Configuration	M_∞	P_∞ (psia)	P_{T_∞} (psia)	T_c ($^{\circ}F$)	P_c (psia)	Comments
31 *	Nozzle 33	3.48	0.67	49.91	450.0	1047.5	Supersonic Test Section
32 *	Air	3.48	0.67	49.90	470.0	1253.6	
33 *	$A/A^* = 5.0$	3.48	0.67	49.90	380.0	492.5	
34 *	$\theta_{lip} = 25^{\circ}$	3.48	0.67	49.90	325.0	219.5	
35 *	Flare = 20°	—	0.40	—	470.0	1275.8	Calibration Data
36 *	Flare = 10°	—	0.40	—	420.0	827.4	Tap 11 Bad
37 *		—	0.40	—	375.0	412.3	
43 *		3.48	0.67	50.02	475.0	1349.3	
44 *		3.48	0.67	50.01	450.0	1048.0	
45 *		3.48	0.67	50.02	385.0	513.2	Jet Off
46 *		3.48	0.67	50.02	320.0	213.2	
46/9 *		3.48	0.67	50.01	—	—	
47/9		0.51	15.14	18.07	—	—	
47		0.51	15.18	18.08	420.0	756.9	Jet Off Transonic Test Section Porous Walls Installed, Tap 11 Bad
48		0.51	15.18	18.07	400.0	592.5	
49		0.50	15.18	18.07	375.0	461.3	
50		0.51	15.19	18.07	360.0	369.0	
51		0.90	10.71	18.08	350.0	335.3	Jet Off
52		0.90	10.73	18.07	370.0	440.7	
53		0.90	10.72	18.07	405.0	633.1	
54		0.90	10.73	18.07	435.0	879.7	
55/9		1.20	7.45	18.07	—	—	Jet Off
55		1.20	7.45	18.07	460.0	1132.6	
56		1.20	7.47	18.07	415.0	720.9	
57		1.20	7.48	18.07	370.0	427.3	
58		1.20	7.50	18.06	340.0	274.2	Jet Off
51/9		0.90	10.65	18.07	—	—	
59/6		1.47	5.73	20.05	—	—	Jet Off

* Indicates schlieren taken.

Table 7 (Continued)

Run No.	Nozzle Configuration	M_∞	P_∞ (psia)	P_{T_∞} (psia)	T_c ($^\circ F$)	P_c (psia)	Comments
59	Nozzle 33	1.47	5.73	20.06	470.0	1295.6	Transonic Test Section Porous Walls Installed, Tap 11 Bad
60	Air	1.47	5.76	20.04	425.0	798.2	
61	$A/A^* = 5.0$	1.47	5.69	20.04	370.0	441.5	
62	$\theta_{lip} = 25^\circ$	1.47	5.73	20.04	335.0	254.6	Jet Off
63/8	Flare = 10°	1.96	3.82	28.07	—	—	
63		1.96	3.80	28.03	325.0	224.9	
64		1.96	3.82	28.02	365.0	395.0	
65		1.95	3.83	28.05	410.0	678.6	
66		1.96	3.81	28.04	475.0	1350.7	
88	Nozzle 31	1.97	3.76	28.01	410.5	706.4	
89	Air	1.96	3.82	28.04	471.9	1132.9	
90	$A/A^* = 8.0$	1.95	6.33	23.28	511.8	1521.8	
91	$\theta_{lip} = 15^\circ$	1.97	7.08	23.45	367.4	460.2	
92	Flare = 10°	1.47	5.75	20.03	368.0	450.6	
93		1.47	6.78	17.75	423.8	674.7	
94		1.45	5.81	20.03	495.9	1056.2	
95		1.45	5.87	20.04	494.0	1568.3	
96		1.18	7.52	18.18	360.9	478.0	
97		1.19	7.53	18.15	426.3	708.2	
98		1.19	7.54	18.15	467.4	983.2	
99		1.20	7.52	18.15	517.6	1440.2	
100		0.89	10.70	18.17	517.1	1388.1	
101		0.96	10.73	18.15	486.3	1005.4	
102		0.95	10.73	18.12	466.6	812.3	
103		0.90	10.70	18.12	438.4	628.0	
104		0.50	15.23	18.14	435.6	717.1	
105		0.50	15.22	18.13	468.7	899.8	
106		0.50	15.24	18.12	484.9	1130.9	
107		0.50	15.23	18.13	501.8	1323.6	

Table 7 (Concluded)

Run No.	Nozzle Configuration	M_∞	P_∞ (psia)	P_{T_∞} (psia)	T_c ($^\circ F$)	P_c (psia)	Comments
108*	Nozzle 31	3.48	0.67	49.88	308.1	204.4	Supersonic Test Section, Tap 11
109	Air	3.48	0.67	49.88	391.9	466.2	Bad
110*	$A/A^* = 8.0$	3.48	0.67	49.87	462.4	799.9	
111*	$\theta_{lip} = 15^\circ$	3.48	0.67	49.88	513.4	1426.1	
111/9*	Flare = 10°	3.48	0.67	49.87	—	—	Jet Off
112*	↓	—	—	—	531.0	1235.1	Calibration Data
113*	↓	—	—	—	392.1	417.5	
114*	↓	—	—	—	513.5	1547.3	
115*	Air	—	—	—	495.6	1538.1	
116*	↓	—	—	—	463.1	1186.1	
117*	↓	—	—	—	351.6	394.2	

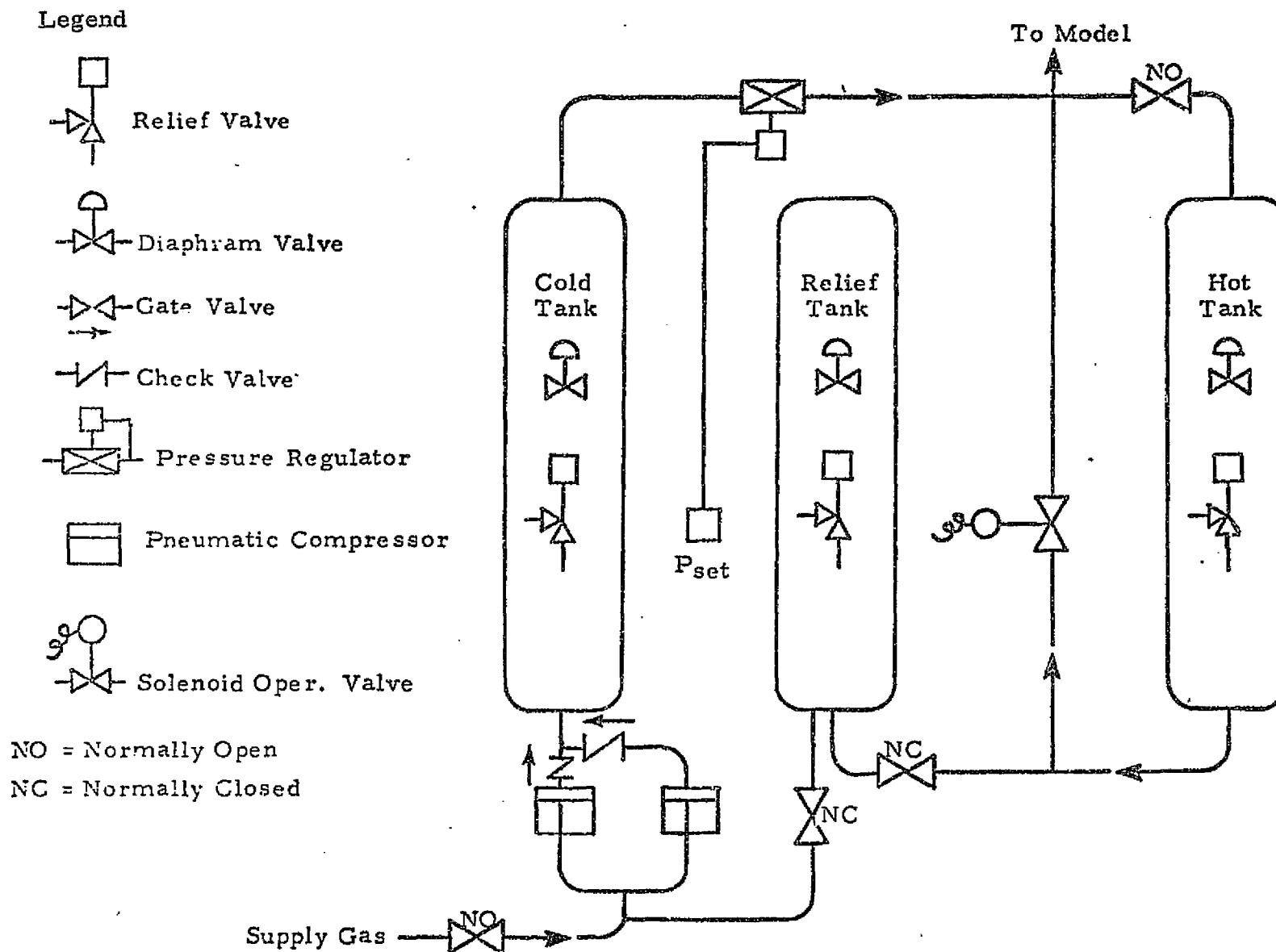


Fig.1 - Schematic of NASA-MSFC Gas Heater

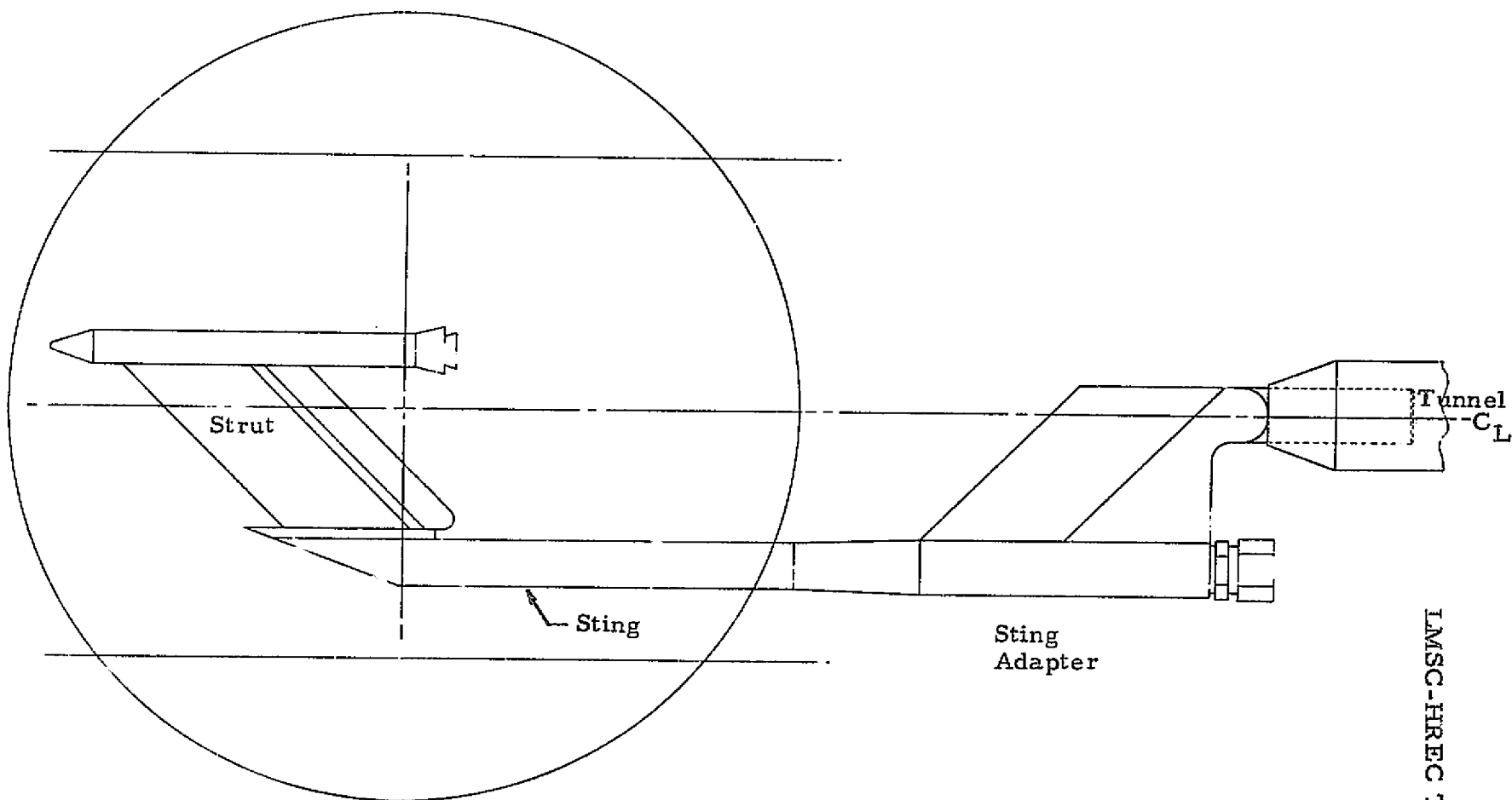


Fig. 2 - Plume Technology Model Installed in the MSFC 14-Inch Trisonic Wind Tunnel

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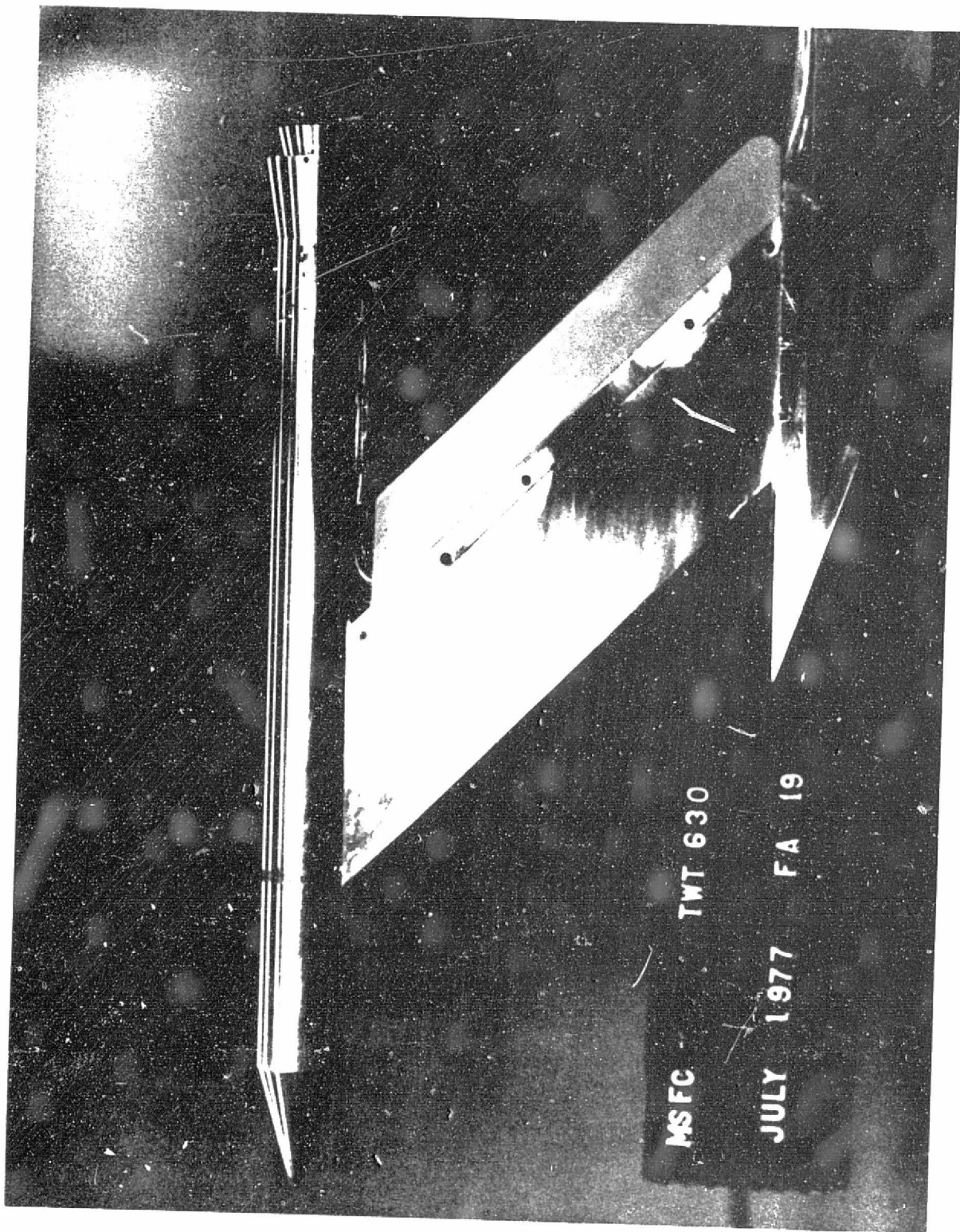
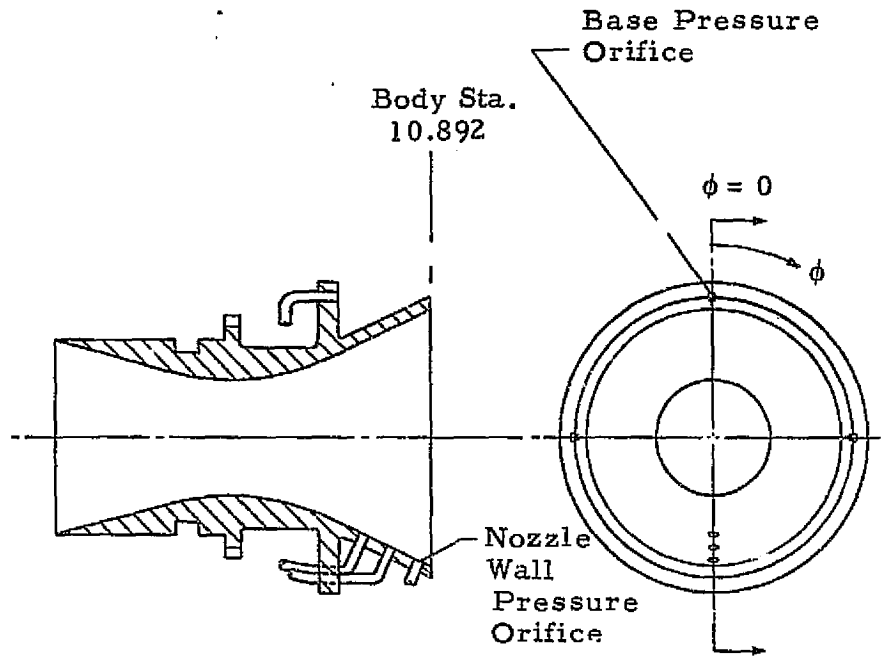


Fig. 3 - Cone-Cylinder-Flare SRB Model Installed in Wind Tunnel



Nozzle Wall Pressure Orifice Locations

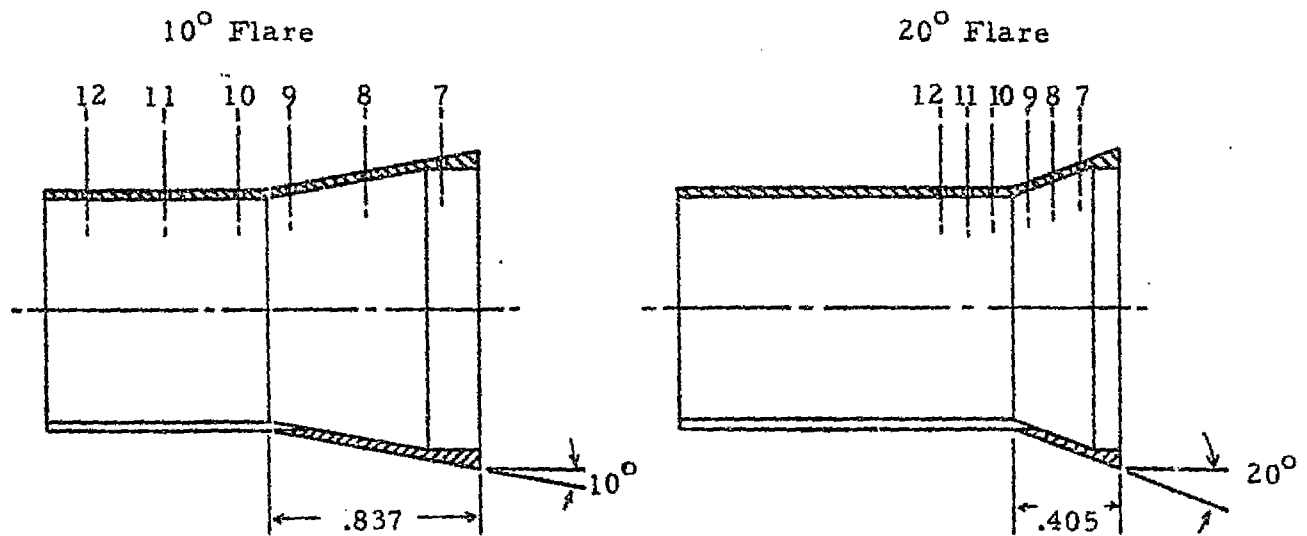
Nozzle No.	Nozzle Config.	Gas	Orifice	Dist. from Exit Plane (in.)	Angular Orientation, ϕ (deg)
31	$A/A^* = 8.0$ $\theta_{lip} = 15^\circ$	CF_4	1	.075	180
			2	.244	180
			3	.525	180
33	$A/A^* = 5.0$ $\theta_{lip} = 25^\circ$	Air	1	.049	180
			2	.134	180
			3	.224	180

Base Pressure Orifice Locations

Orifice No.	Body Station	Radial Location (in.)	Angular Location, ϕ (deg)
4	10.892	.50	0
5	10.892	.50	90
6	10.892	.50	270

Fig.4 - Plume Technology Model Pressure Orifice Locations
a. Nozzle Wall and Model Base

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Orifice No.	Distance from Base of Skirt (in.)	Angular Location (deg)
7	.149	0
8	.444	
9	.739	
10	.937	
11	1.237	
12	1.537	

Orifice No.	Distance from Base of Skirt (in.)	Angular Location (deg)
7	.135	0
8	.235	
9	.335	
10	.475	
11	.575	
12	.675	

Fig. 4 (Concluded)

b. Flare Configurations

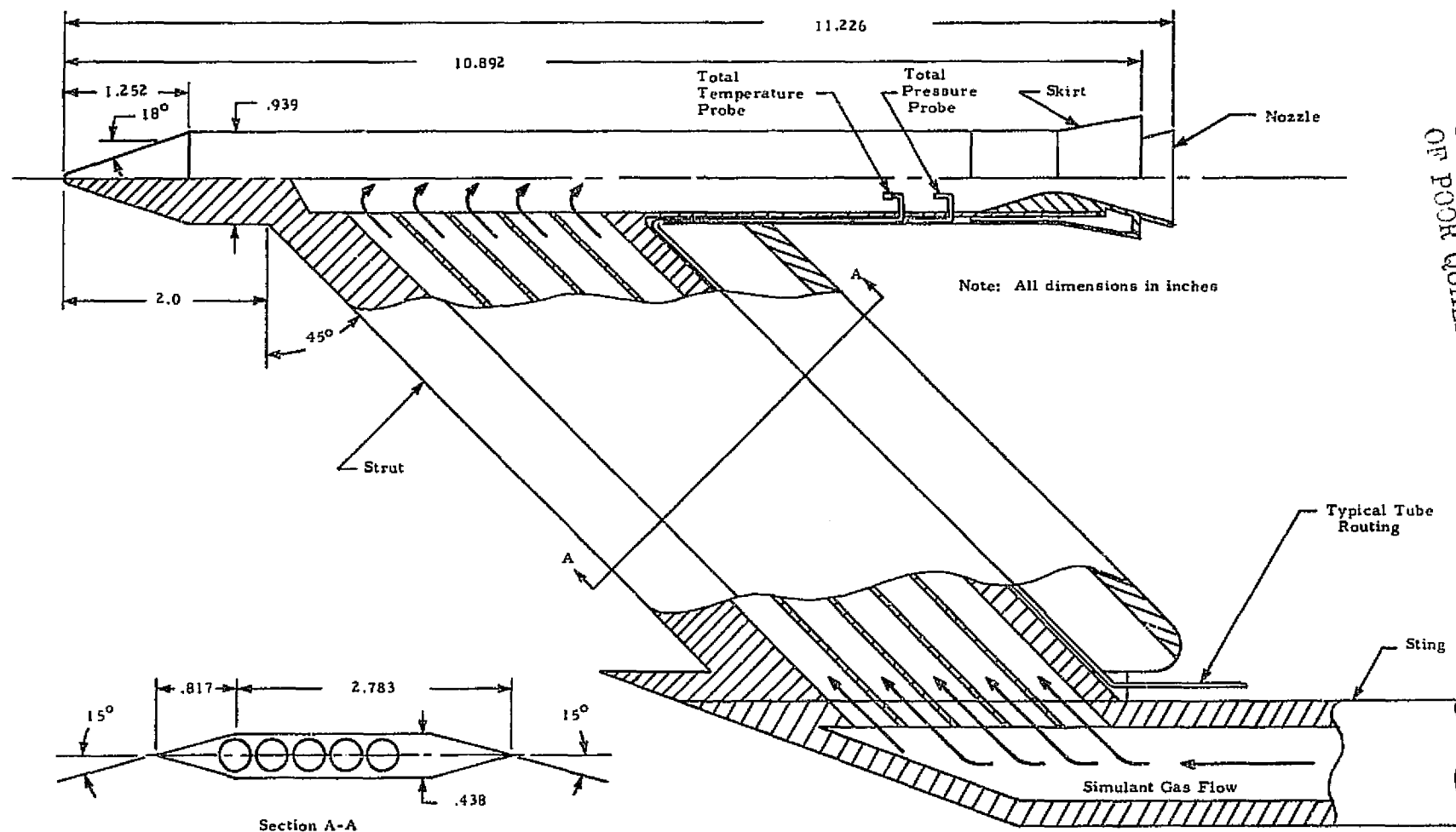


Fig.5 - Plume Technology Model

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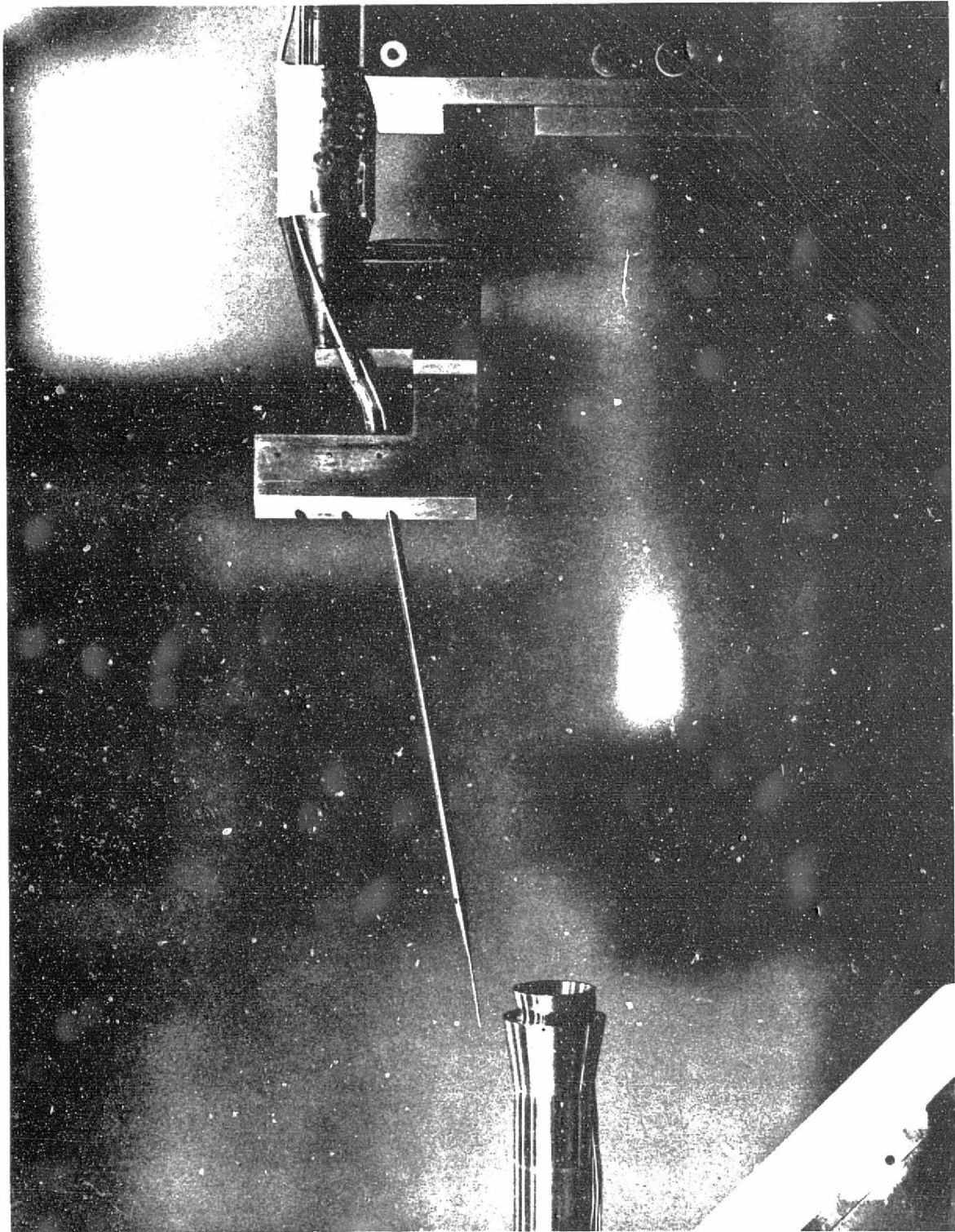


Fig. 6 - Probe Installed to Measure Pitot Pressure on Flare



Fig. 7 - Example of Separation on 20-Degree Flare
 $M_\infty = 1.46$, Jet Off

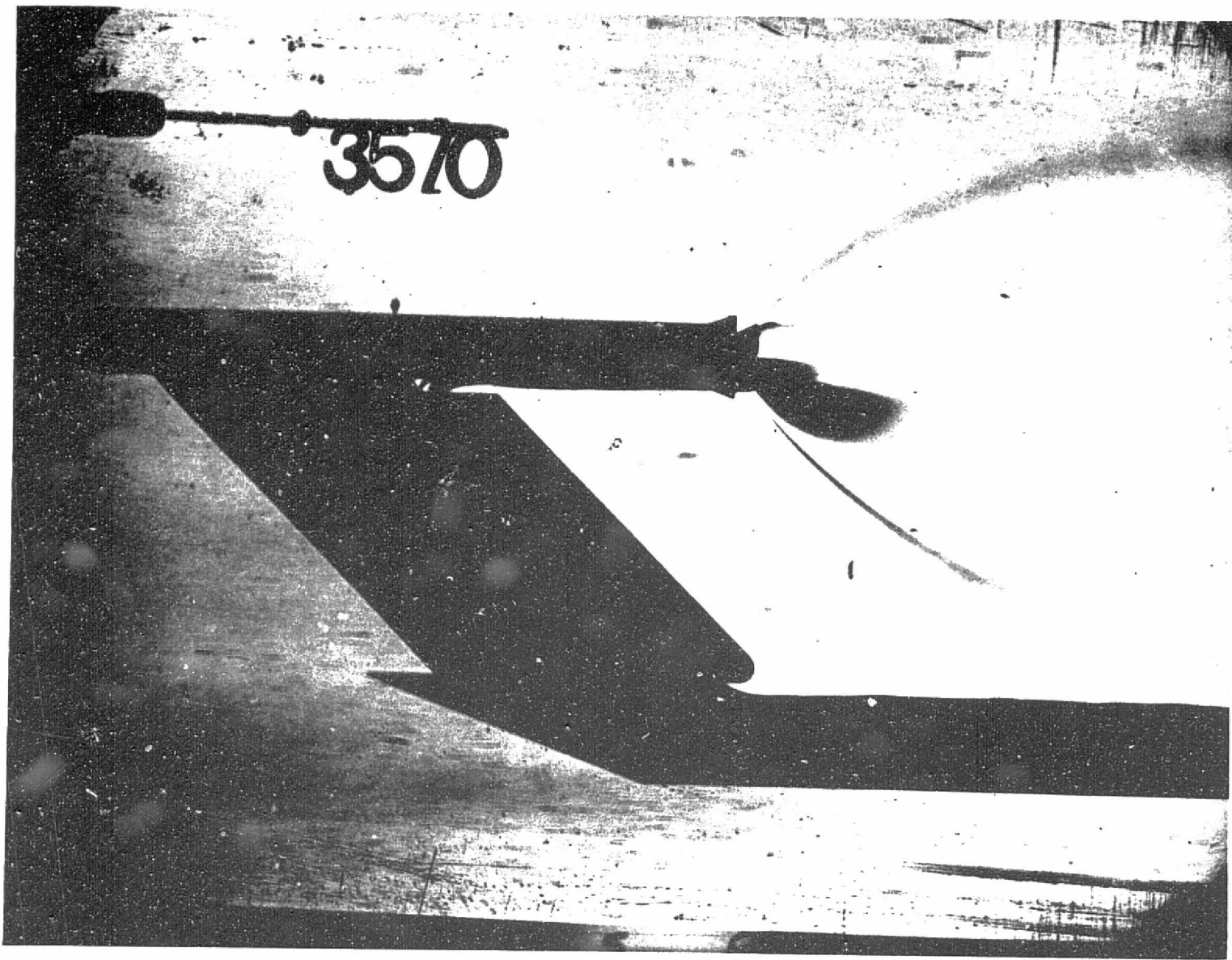


Fig. 8 - Schlierens Taken During Nozzle 33 Calibration Flowing Air
 a. $P_c = 1276$ psia, $T_c = 470.0$ F, $P_\infty = .4$ psia

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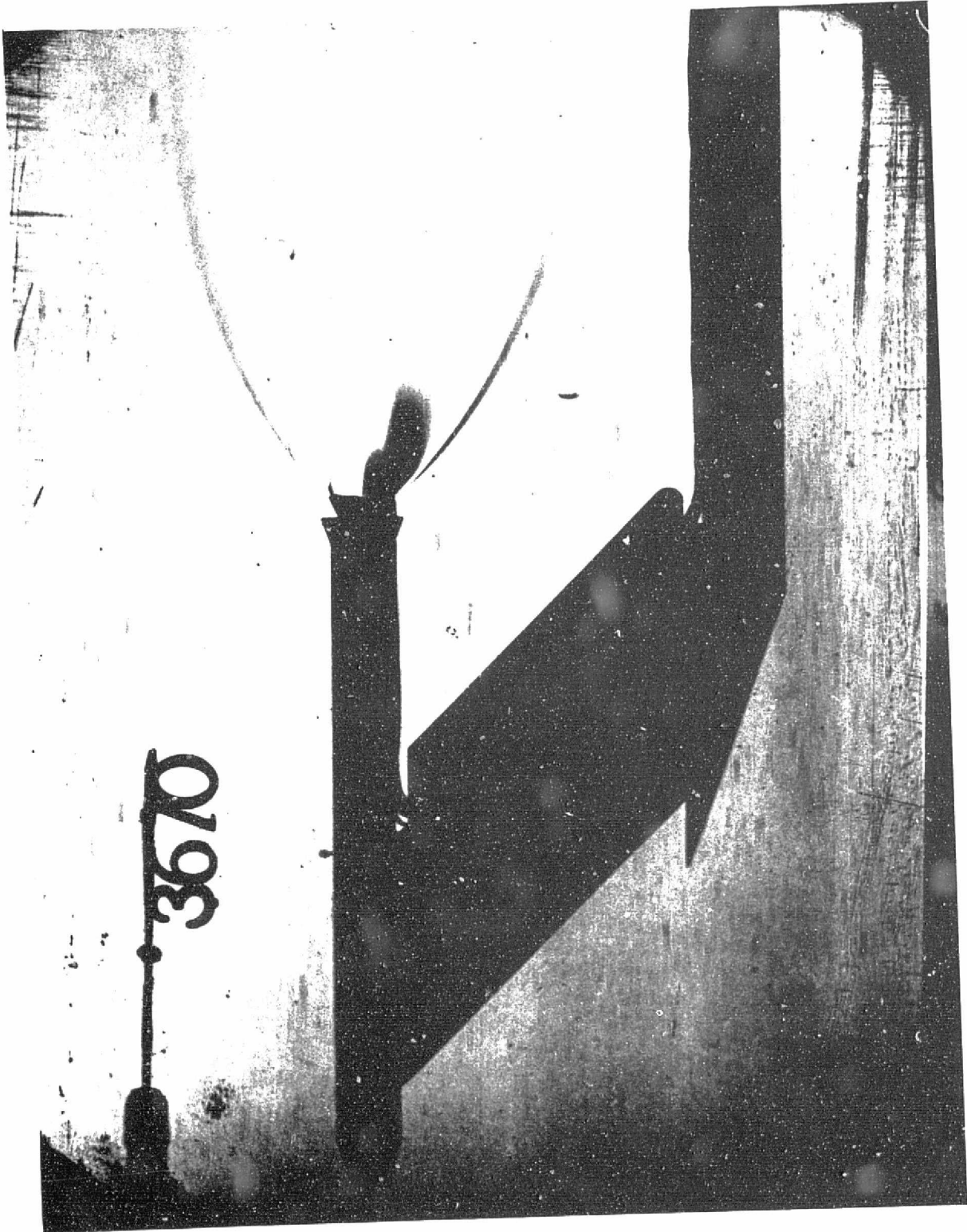


Fig. 8 (Continued)
b. $P_c = 827.4$ psia, $T_c = 420.0$ F, $P_\infty = .4$ psia

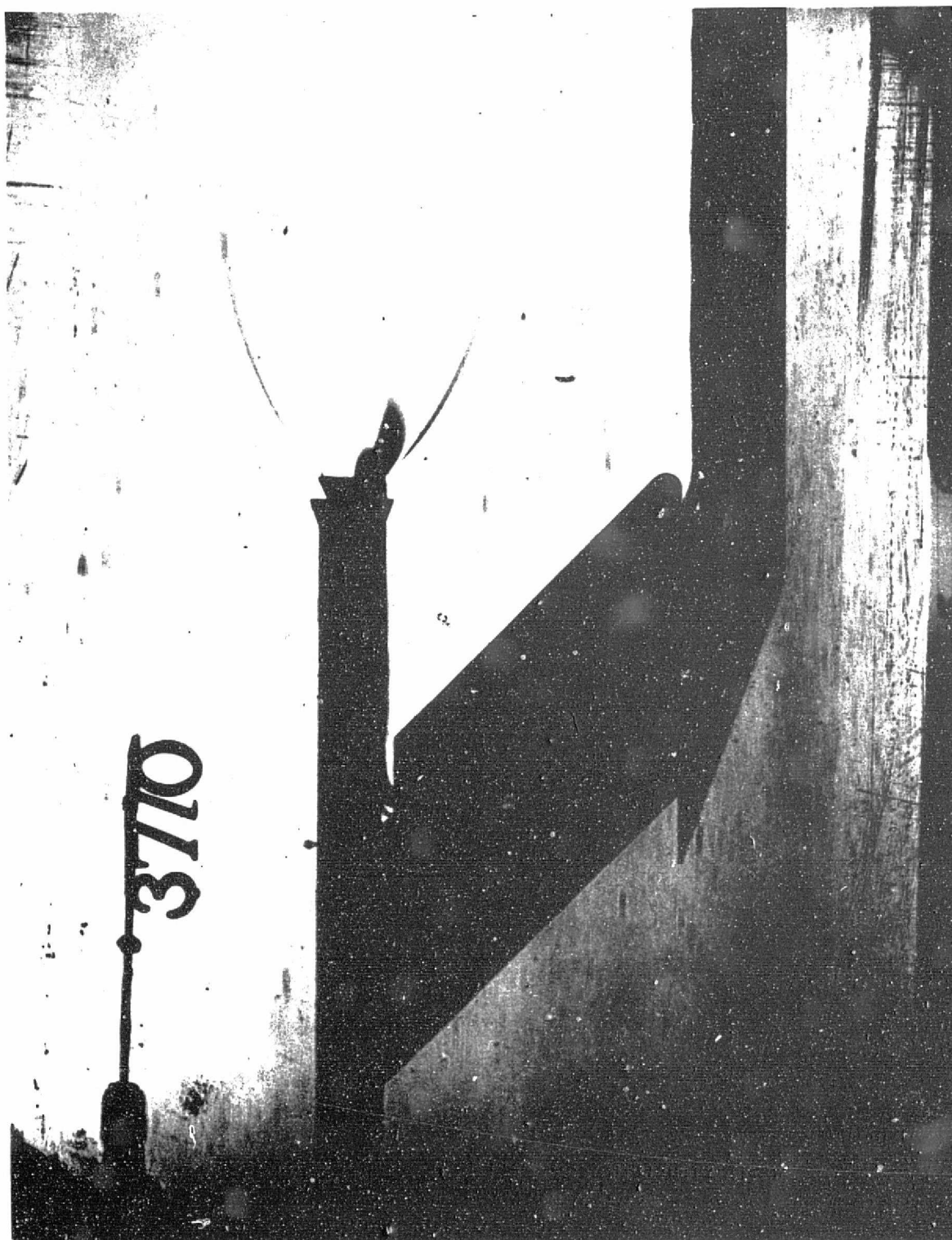


Fig. 8 (Concluded)
c. $P_c = 412.3$ psia, $T_c = 375.0$ F, $P_\infty = .40$ psia

Appendix

This appendix presents all of the local Mach number, calibration and non-quiescent tabulated data obtained during the test program. Tables 5 and 6 summarize the calibration and non-quiescent nominal test conditions and Table 7 is a detailed run log of those two phases of the test with qualifying comments pertinent to each data point. The local Mach number run log and results are shown in Table A-1 with comments pertinent to each data point. These tables should be used to locate any particular data point by noting the run number in the table and then referring to the tabulated data. The parameters in the tabulated data are defined in the nomenclature of this appendix.

Eleven frames of data were taken for all runs. For the calibration runs the data shown is a representative frame from all eleven. This could be done because nozzle pressure ratios varied little with plenum chamber pressure. The non-quiescent data and local Mach number data presented are an average of several frames. The frames utilized for averaging covered the highest plateau of model plenum chamber pressure. The data used for averaging is available. Mach numbers presented may be in error by ± 0.2 . The tabulated tunnel conditions (PSA and PTA) should be used to obtain the correct Mach number.

Schlieren photographs were taken for all calibration runs plus several non-quiescent runs (Table 7). The frame number of each schlieren is noted on strip charts for each run which are available. Both schlierens and shadow-graphs were taken during the local Mach number investigation as shown in Table A-1.

NOMENCLATURE

Symbol	Description
A	perpendicular distance from center of probe to flare measured prior to run, in.
B	horizontal distance from center of flare to nozzle exit plane, in.
M	freestream Mach number
NO	pressure orifice number
Q	freestream dynamic pressure, psia
PSA	freestream static pressure, psia
PSC	model chamber static pressure, psia
PSM/PSA	model surface or base static pressure to freestream static pressure ratio
PTA	freestream total pressure, psia
PTC	model chamber total pressure, psia
PTC/P1	model chamber total pressure to nozzle wall static pressure ratio (see Figs. 4b and 4c for respective locations), psia
PTC/P2	
PTC/P3	
P4/PSA	model base static pressure to freestream static pressure ratio (see Figs. 4b and 4c for respective locations), psia
P5/PSA	
P6/PSA	
RN/L	freestream Reynolds number per foot, $1/\text{ft} \times 10^{-6}$
TEMP	freestream total temperature, F
TC	model chamber total temperature, F

Table A-1
LOCAL MACH NUMBER RUN SCHEDULE

Run No.	Nozzle Configuration	M_∞	P_∞ (psia)	P_{T_∞} (psia)	T_c ($^{\circ}F$)	P_c (psia)	Pitot Pressure		Pitot Pressure (psia)	Comments
							A (in.)	B (in.)		
1/0*	Nozzle 33	1.20	7.34	18.04	—	—	0.2800	0.489	—	Pitot Pressure Invalid Due to Flow Separation Forward of Flare
1/1*	Single	1.20	7.36	18.04	—	—			—	
2/0*	$A/A^* = 5.0$ $\theta_{lip} = 25^{\circ}$	1.20	7.28	18.04	355.0	350.8			—	
3/0*		0.50	15.14	18.04	—	—			—	
4/0*	Flare = 20°	0.90	10.70	18.05	—	—			—	
5/1*		1.46	5.45	20.03	—	—			—	
6/0*		1.96	3.66	28.04	—	—			—	
7/0*		1.96	3.48	28.06	470.0	1319.2			—	
8/2		1.96	3.84	28.04	—	—			—	
9/0		1.96	3.81	28.04	475.0	1337.0			—	
10/1		1.96	3.81	28.05	360.0	394.9			—	
38/9*		3.48	0.67	49.91	—	—	0.28	0.489	10.09	
38/8*		3.48	0.67	49.90	—	—	0.15	0.494	12.93	
38/7*		3.48	0.67	49.90	—	—	0.10	0.496	5.47	
38/6*		3.48	0.67	49.90	—	—	0.11	0.486	7.36	
38/5*		3.48	0.67	49.90	—	—	0.12	0.490	7.61	
38/4*		3.48	0.67	49.94	—	—	0.13	0.485	8.70	
38/3*		3.48	0.67	49.96	—	—	0.16	0.490	13.80	
38/2*		3.48	0.67	49.96	—	—	0.17	0.490	13.86	
38/1*		3.48	0.67	49.96	—	—	0.18	0.490	14.02	
38/0*		3.48	0.67	49.95	—	—	0.19	0.490	12.51	
39/9*		3.48	0.67	49.97	—	—	0.20	0.490	10.10	
39/2*		3.48	0.67	49.93	445.0	1001.9	0.09	0.490	8.51	
39/3*		3.48	0.67	49.93	445.0	998.6	0.11	0.490	8.70	
39/4*		3.48	0.67	49.93	445.0	1001.3	0.15	0.490	8.79	
39/5*		3.48	0.67	49.93	450.0	1030.7	0.20	0.490	8.90	
39/6*		3.48	0.67	49.93	445.0	1002.0	0.23	0.490	8.54	
39/7*		3.48	0.67	49.93	450.0	1016.4	0.18	0.490	7.68	
39/12*		3.48	0.67	49.94	445.0	1001.4	0.14	0.500	13.33	
39/13*		3.48	0.67	50.01	445.0	988.4	0.13	0.500	13.87	
39/14*		3.48	0.67	50.00		999.7	0.12	0.500	13.79	
39/15*		3.48	0.67	50.01		998.1	0.11	0.500	13.65	
39/16*		3.48	0.67	50.00		1009.4	0.15	0.500	11.24	
39/17*		3.48	0.67	50.01		997.3	0.09	0.500	9.84	
39/18*		3.48	0.67	50.01		997.5	0.10	0.500	11.36	
39/10*		3.48	0.67	50.01	—	—	0.18	0.490	13.11	
38/11*		3.48	0.67	50.01	—	—	0.19	0.490	12.45	

*Indicates schlieren taken.

Table A-1 (Continued)

Run No.	Nozzle Configuration	M _∞	P _∞ (psia)	P _{T∞} (psia)	T _c (°F)	P _c (psia)	Pitot Location		Pitot Pressure (psia)	Comments
							A (in.)	B (in.)		
40/0*	Nozzle 33	3.48	0.67	50.01	—	—	0.13	0.481	9.25	
40/1*	Single	3.48	0.67	50.01	—	—	0.20		13.92	
40/2*	A/A* = 5.0	3.48	0.67	50.01	—	—	0.23		14.54	
40/3*	θ _{lip} = 25°	3.48	0.67	50.01	—	—	0.24		14.50	
40/4*	Flare = 10°	3.48	0.67	50.01	—	—	0.25		12.32	
41/0*		3.48	0.67	50.01	470.0	1252.2	0.14		10.60	
41/1*		3.48	0.67	50.01	470.0	1258.8	0.10		10.60	
41/2*		3.48	0.67	50.01	475.0	1272.9	0.07		12.48	
41/3*		3.48	0.67	50.01	475.0	1273.8	0.05		14.38	
41/4*		3.48	0.67	50.02	475.0	1270.4	0.06		14.35	
41/6*		3.48	0.67	50.01	475.0	1290.6	0.04		13.66	
41/7*		3.48	0.67	50.01	475.0	1298.6	0.03		14.50	
42/0*		3.48	0.67	50.01	445.0	1008.7	0.02		12.99	
42/1*		3.48	0.67	50.01		1003.7	0.03		13.72	
42/2*		3.48	0.67	50.01		1001.6	0.04		13.75	
42/3*		3.48	0.67	50.01		1007.1	0.05		13.90	
42/4*		3.48	0.67	50.01		997.4	0.06		14.30	
42/5*		3.48	0.67	50.01		1002.9	0.07		14.40	
42/6*		3.48	0.67	50.01		1001.9	0.09		14.45	
42/7*		3.48	0.67	50.01		1001.8	0.10		14.26	
42/8*		3.48	0.67	50.02		988.4	0.11		14.26	
42/9*		3.48	0.67	50.01	↓	994.7	0.12		13.38	
67/0*		1.96	3.81	28.05	—	—	0.20		22.77	
67/1*		1.96	3.81	28.04	—	—	0.21		22.90	
67/2*		1.96	3.81	28.05	—	—	0.23		23.20	
67/3*		1.96	3.81	28.05	—	—	0.25		23.30	
67/4*		1.96	3.80	28.04	—	—	0.27		23.36	
67/5*		1.96	3.80	28.05	—	—	0.29		23.36	
68/0*		1.96	3.80	28.05	445.0	992.5	0.04		10.70	
68/1*		1.96	3.81	28.05		1003.9	0.08		10.35	
68/2*		1.96	3.80	28.04		990.1	0.12		14.50	
68/3*		1.96	3.81	28.05		998.5	0.14		14.37	
68/4*		1.96	3.82	28.04		996.8	0.18		20.76	
68/5*		1.96	3.81	28.03		983.5	0.22		23.39	
68/6*		1.96	3.82	28.02		985.9	0.24		23.52	
68/7*		1.96	3.82	28.01		994.3	0.26		23.54	
69/0*		1.46	5.74	20.01	↓	—	0.20		19.16	

*Indicates schlieren taken.

Table A-1 (Continued)

Run No.	Nozzle Configuration	M _∞	P _∞ (psia)	P _{T∞} (psia)	T _c (°F)	P _c (psia)	Pitot Pressure		Pitot Pressure (psia)	Comments
							A (in.)	B (in.)		
69/1*	Nozzle 33	1.46	5.74	20.01	—	—	0.24	0.481	19.70	Flow Appear Separated Forward of Flare
69/2*	Single	1.46	5.72	20.04	—	—	0.15		16.60	
70/0*	A/A* = 5.0	1.46	5.73	20.04	445.0	993.0	0.24		19.78	
71/0*	θ _{lip} = 25°	1.46	5.73	20.05	—	—	0.20		19.79	
71/1+	Flare = 10°	1.46	5.73	20.04	445.0	981.4	0.20		19.72	
71/2+		1.46	5.76	20.05		1000.2	0.10		11.20	
71/3+		1.46	5.76	20.06		993.3	0.12		12.72	
71/4+		1.46	5.74	20.05		1001.5	0.14		14.67	
71/5+		1.46	5.72	20.04		1004.1	0.16		19.14	
71/6+		1.46	5.74	20.04		998.8	0.17		18.88	
71/7+		1.46	5.73	20.05		984.8	0.26		19.79	Probe Positioned Over Port 8
71/8+		1.46	5.75	20.06		962.3	0.35		19.82	
72/0+		1.20	7.29	18.05		1003.4	0.20		17.82	
72/1+		1.20	7.30	18.05		1004.7	0.30		18.05	
72/2+		1.20	7.22	18.05		999.3	0.40		18.06	
72/3+		1.20	7.46	18.04	445.0	916.7	0.45		18.05	
73/1+		1.20	7.44	18.05	—	—	0.35		18.03	
73/2+		1.20	7.43	18.04	—	—	0.25		18.03	
73/3+		1.20	7.44	18.04	—	—	0.20		17.94	
73/4+		1.20	7.44	18.04	—	—	0.20	See Comment	18.03	
73/5+		1.20	7.45	18.04	—	—	0.20	See Comment	16.80	Probe Positioned Over Port 9
74/0+		0.90	10.63	18.04	—	—	0.20	0.481	16.83	
74/1+		0.90	10.63	18.05	—	—	0.30		17.58	
74/2+		0.90	10.63	18.05	—	—	0.40		17.90	
74/3+		0.90	10.64	18.04	—	—	0.15		16.47	
75/0+		0.90	10.62	18.04	445.0	956.4	0.15		15.91	
75/1+		0.90	10.65	18.05		1002.2	0.10		14.62	
75/2+		0.90	10.65	18.05		996.8	0.13		15.43	
75/3+		0.90	10.60	18.10		995.6	0.20		16.54	
75/4+		0.90	10.65	18.10		999.0	0.25		17.06	
74/4+		0.90	10.63	18.09		—	0.35		17.78	
76/0+		0.50	15.12	18.09	—	—	0.10		17.84	
76/1+		0.50	15.15	18.11	—	—	0.20		18.16	
76/2+		0.50	15.16	18.10	—	—	0.30		18.16	
76/3		0.5	15.18	18.07	—	—	0.4		18.12	
76/4		0.5	15.19	18.07	—	—	0.15		18.08	
77/0		0.5	15.18	18.08	445.0	1001.2	0.20		18.05	

* Indicates schlieren taken.

+ Indicates shadowgraph taken.

Table A-1 (Concluded)

Run No.	Nozzle Configuration	M_{∞}	P_{∞} (psia)	$P_{T_{\infty}}$ (psia)	T_c (°F)	P_c (psia)	Pitot Pressure		Pitot Pressure (psia)	Comments
							A (in.)	B (in.)		
77/1	Nozzle 33	0.5	15.19	18.07	445.0	1015.0	0.4	0.481	18.13	
77/3 [†]	Single	0.5	15.21	18.08	445.0	1016.4	0.15		17.44	
76/5 [†]	A/A* = 5.0	0.5	15.22	18.08	—	—	0.15		18.12	
78/0	$\theta_{lip} = 25^{\circ}$	0.5	15.23	18.07	—	—	0.15		18.12	
79/0	Flare = 10°	0.5	15.25	18.09	445.0	1002.3	0.15		17.53	
80/0		0.9	10.69	18.07	—	—	0.20		17.67	
81/0		0.9	10.67	18.06	445.0	999.4	0.20		16.96	
82/0		1.20	7.48	18.07	—	—	0.25		18.08	
83/0		1.20	7.52	18.07	445.0	994.6	0.30		18.08	
84/0		1.46	5.77	20.05	—	—	0.26		19.73	
85/0		1.46	5.75	20.05	445.0	1001.9	0.26		19.69	
86/0		1.96	3.83	28.04	—	—	0.26		23.27	
87/0		1.96	3.83	28.05	445.0	1003.1	0.29		23.33	

[†]Indicates shadowgraph taken.

TEST FA-19,FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 11/ 1

WIND TUNNEL TEST CONDITIONS

M = 1.96 Q = 10.274 PTA = 28.060 PSA = 3.830 TEMP = 98.341 RN/L = 13.939 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 220.2 [REDACTED] PTC/PSA = 57.5

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 44.8 PTC/P2 = 33.9 PTC/P3 = 26.3

AVERAGED BASE PRESSURES

P4/PSA = .574 P5/PSA = .549 P6/PSA = .561

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.968	10	1.563
8	1.913	11	1.339
9	1.796	12	.970

TEST FA-19.FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 12/ 0

WIND TUNNEL TEST CONDITIONS

M = 1.96 Q = 10.229 PTA = 28.045 PSA = 3.786 TEMP = 99.463 RN/L = 13.901 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 390.2 [REDACTED] PTC/PSA = 103.1

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 46.7 PTC/P2 = 35.3 PTC/P3 = 27.4

AVERAGED BASE PRESSURES

P4/PSA = .721 P5/PSA = .687 P6/PSA = .712

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.984	10	1.572
8	1.924	11	1.354
9	1.805	12	.983

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TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL, HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 13/ 0

WIND TUNNEL TEST CONDITIONS

$M = 1.96$ $Q = 10.156$ $PTA = 28.058$ $PSA = 3.704$ $TEMP = 88.888$ $RN/L = 13.905 \times E5$

AVERAGED CHAMBER PARAMETERS

$PTC = 657.1$ [REDACTED] $PTC/PSA = 177.4$

AVERAGED NOZZLE PARAMETERS

$PTC/P1 = 46.1$ $PTC/P2 = 35.0$ $PTC/P3 = 27.4$

AVERAGED BASE PRESSURES

$P4/PSA = .866$ $P5/PSA = .825$ $P6/PSA = .863$

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	2.006	10	1.565
8	1.931	11	1.321
9	1.808	12	.983

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TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 147 0

WIND TUNNEL TEST CONDITIONS

$M = 1.96$ $Q = 10.256$ $PTA = 28.043$ $PSA = 3.815$ $TEMP = 99.487$ $RN/L = 13.893 \times E5$

AVERAGED CHAMBER PARAMETERS

$PTC = 1296.7$ $PTC/PSA = 339.9$

AVERAGED NOZZLE PARAMETERS

$PTC/P1 = 46.2$ $PTC/P2 = 35.4$ $PTC/P3 = 28.0$

AVERAGED BASE PRESSURES

$P4/PSA = 1.072$ $P5/PSA = 1.044$ $P6/PSA = 1.078$

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.947	10	1.551
8	1.881	11	1.379
9	1.759	12	1.026

TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL, HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 15/ 9

WIND TUNNEL TEST CONDITIONS

M = 1.46 Q = 8.619 PTA = 20.926 PSA = 5.737 TEMP = 88.888 RN/L = 8.689 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 4.0 [REDACTED] PTC/PSA = .7

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 1.0 PTC/P2 = 1.0 PTC/P3 = 1.0

AVERAGED BASE PRESSURES

P4/PSA = .496 P5/PSA = .472 P6/PSA = .489

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.593	10	1.533
8	1.622	11	1.482
9	1.601	12	1.392

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TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 15/ 0

WIND TUNNEL TEST CONDITIONS

$M = 1.46$ $Q = 8.622$ $PTA = 20.027$ $PSA = 5.771$ $TEMP = 99.707$ $RN/L = 8.681 \times E5$

AVERAGED CHAMBER PARAMETERS

$PTC = 1326.8$ $PTC/PSA = 229.9$

AVERAGED NOZZLE PARAMETERS

$PTC/P1 = 46.2$ $PTC/P2 = 35.4$ $PTC/P3 = 28.0$

AVERAGED BASE PRESSURES

$P4/PSA = 1.102$ $P5/PSA = 1.076$ $P6/PSA = 1.098$

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.565	10	1.482
8	1.575	11	1.441
9	1.547	12	1.373

TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL, HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 16/ 0

WIND TUNNEL TEST CONDITIONS

$M = 1.44$ $Q = 8.620$ $PTA = 20.030$ $PSA = 5.738$ $TEMP = 88.888$ $RN/L = 8.694 \times E5$

AVERAGED CHAMBER PARAMETERS

$PTC = 791.5$ $PTC/PSA = 137.9$

AVERAGED NOZZLE PARAMETERS

$PTC/P1 = 46.1$ $PTC/P2 = 35.1$ $PTC/P3 = 27.6$

AVERAGED BASE PRESSURES

$P4/PSA = .943$ $P5/PSA = .912$ $P6/PSA = .939$

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.569	10	1.492
8	1.582	11	1.449
9	1.557	12	1.378

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TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 17/ 0

WIND TUNNEL TEST CONDITIONS

$M = 1.47$ $Q = 8.618$ $PTA = 20.025$ $PSA = 5.732$ $TEMP = 88.888$ $RN/L = 8.657 \times 10^{-5}$

AVERAGED CHAMBER PARAMETERS

$PTC = 438.5$ $PTC/PSA = 76.5$

AVERAGED NOZZLE PARAMETERS

$PTC/P1 = 46.7$ $PTC/P2 = 35.2$ $PTC/P3 = 27.5$

AVERAGED BASE PRESSURES

$P4/PSA = .785$ $P5/PSA = .748$ $P6/PSA = .776$

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.580	10	1.506
8	1.596	11	1.460
9	1.573	12	1.384

WIND TUNNEL TEST CONDITIONS

M = 1.45 Q = 8.623 PTA = 20.031 PSA = 5.763 TEMP = 88.888 RN/L = 8.638 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 252.0 [REDACTED] PTC/PSA = 43.7

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 48.1 PTC/P2 = 35.8 PTC/P3 = 27.6

AVERAGED BASE PRESSURES

P4/PSA = .643 P5/PSA = .606 P6/PSA = .632

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.578	10	1.510
8	1.597	11	1.463
9	1.575	12	1.383

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WIND TUNNEL TEST CONDITIONS

 $M = 1.21$ $Q = 7.511$ $PTA = 17.997$ $PSA = 7.310$ $TEMP = 88.888$ $RN/L = 6.586 \times E5$

AVERAGED CHAMBER PARAMETERS

 $PTC = 5.6$ $PTC/PSA = .8$

AVERAGED NOZZLE PARAMETERS

 $PTC/P1 = 1.1$ $PTC/P2 = 1.0$ $PTC/P3 = 1.0$

AVERAGED BASE PRESSURES

 $P4/PSA = .677$ $P5/PSA = .664$ $P6/PSA = .671$

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.392	10	1.406
8	1.439	11	1.376
9	1.448	12	1.336

WIND TUNNEL TEST CONDITIONS

 $M = 1.19$ $Q = 7.494$ $PTA = 18.022$ $PSA = 7.419$ $TEMP = 88.888$ $RN/L = 6.536 \cdot ES$

AVERAGED CHAMBER PARAMETERS

 $PTC = 273.0$ $PTC/PSA = 36.8$

AVERAGED NOZZLE PARAMETERS

 $PTC/P1 = 47.9$ $PTC/P2 = 35.8$ $PTC/P3 = 27.6$

AVERAGED BASE PRESSURES

 $P4/PSA = .608$ $P5/PSA = .596$ $P6/PSA = .605$

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.375	10	1.385
8	1.418	11	1.357
9	1.425	12	1.319

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TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 20/ 0

WIND TUNNEL TEST CONDITIONS

M = 1.21 Q = 7.492 PTA = 18.049 PSA = 7.477 TEMP = 88.888 RN/L = 6.515 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 420.0 [REDACTED] PTC/PSA = 56.2

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 46.8 PTC/P2 = 35.2 PTC/P3 = 27.4

AVERAGED BASE PRESSURES

P4/PSA = .717 P5/PSA = .705 P6/PSA = .717

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.367	10	1.374
8	1.408	11	1.346
9	1.414	12	1.310

TEST FA-19,FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 21/ 0

WIND TUNNEL TEST CONDITIONS

M = 1.19 Q = 7.512 PTA = 18.053 PSA = 7.412 TEMP = 88.888 RN/L = 6.554 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 708.8 [REDACTED] PTC/PSA = 95.6

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 46.0 PTC/P2 = 35.0 PTC/P3 = 27.4

AVERAGED BASE PRESSURES

P4/PSA = .862 P5/PSA = .848 P6/PSA = .863

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.372	10	1.372
8	1.410	11	1.346
9	1.412	12	1.310

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TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL, HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 22/ 0

WIND TUNNEL TEST CONDITIONS

$M = 1.23$ $Q = 7.515$ $PTA = 18.374$ $PSA = 7.443$ $TEMP = 88.888$ $RN/L = 6.549 * E5$

AVERAGED CHAMBER PARAMETERS

$PTC = 1097.6$ [REDACTED] $PTC/PSA = 147.5$

AVERAGED NOZZLE PARAMETERS

$PTC/P_1 = 46.0$ $PTC/P_2 = 35.2$ $PTC/P_3 = 27.8$

AVERAGED BASE PRESSURES

$P_4/PSA = 1.012$ $P_5/PSA = .998$ $P_6/PSA = 1.010$

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.376	10	1.367
8	1.409	11	1.342
9	1.408	12	1.307

TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 23/ 9

WIND TUNNEL TEST CONDITIONS

M = .88 Q = 5.945 PTA = 10.064 PSA = 10.886 TEMP = 88.888 RN/L = 4.498 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 9.4 [REDACTED] PTC/PSA = .9

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 1.0 PTC/P2 = 1.0 PTC/P3 = 1.0

AVERAGED BASE PRESSURES

P4/PSA = .832 P5/PSA = .833 P6/PSA = .834

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.079	10	1.180
8	1.137	11	1.150
9	1.186	12	1.124

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TEST FA-19,FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL, HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 23/ 0

WIND TUNNEL TEST CONDITIONS

M = .88 Q = 5.973 PTA = 18.085 PSA = 10.841 TEMP = 88.888 RN/L = 4.516 ° E5

AVERAGED CHAMBER PARAMETERS

PTC = 917.8 [REDACTED] PTC/PSA = 84.7

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 45.8 PTC/P2 = 35.0 PTC/P3 = 27.6

AVERAGED BASE PRESSURES

P4/PSA = .888 P5/PSA = .883 P6/PSA = .889

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.099	10	1.184
8	1.152	11	1.158
9	1.194	12	1.133

TEST FA-19,FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 24/ 1

WIND TUNNEL TEST CONDITIONS

M = .91 Q = 8.083 PTA = 18.035 PSA = 10.601 TEMP = 88.888 RN/L = 4.660 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 651.0 [REDACTED] PTC/PSA = 61.4

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 46.1 PTC/P2 = 35.0 PTC/P3 = 27.5

AVERAGED BASE PRESSURES

P4/PSA = .808 P5/PSA = .800 P6/PSA = .812

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.099	10	1.192
8	1.159	11	1.166
9	1.201	12	1.140

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WIND TUNNEL TEST CONDITIONS

 $M = .93$ $Q = 6.099$ $PTA = 18.037$ $PSA = 10.575$ $TEMP = 88.888$ $RN/L = 4.671 \times E5$

AVERAGED CHAMBER PARAMETERS

 $PTC = 443.1$ $PTC/PSA = 41.9$

AVERAGED NOZZLE PARAMETERS

 $PTC/P1 = 46.5$ $PTC/P2 = 35.2$ $PTC/P3 = 27.4$

AVERAGED BASE PRESSURES

 $P4/PSA = .707$ $P5/PSA = .696$ $P6/PSA = .709$

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.091	10	1.191
8	1.154	11	1.164
9	1.201	12	1.137

TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 26/ 0

WIND TUNNEL TEST CONDITIONS

M = .92 Q = 6.088 PTA = 19.039 PSA = 10.595 TEMP = 88.888 RN/L = 4.660 * ES

AVERAGED CHAMBER PARAMETERS

PTC = 330.0 [REDACTED] PTC/PSA = 31.1

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 46.2 PTC/P2 = 34.9 PTC/P3 = 27.1

AVERAGED BASE PRESSURES

P4/PSA = .632 P5/PSA = .620 P6/PSA = .634

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.097	10	1.190
8	1.152	11	1.162
9	1.199	12	1.135

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TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 27/ 9

WIND TUNNEL TEST CONDITIONS

M = .51 Q = 2.729 PTA = 18.020 PSA = 15.110 TEMP = 88.888 RN/L = 1.827 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 14.5 [REDACTED] [REDACTED] PTC/PSA = 1.0

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 1.0 PTC/P2 = 1.0 PTC/P3 = 1.0

AVERAGED BASE PRESSURES

P4/PSA = .947 P5/PSA = .945 P6/PSA = .945

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.013	10	1.049
8	1.033	11	1.039
9	1.050	12	1.031

TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 27/ 0

WIND TUNNEL TEST CONDITIONS

$M = .53$ $Q = 2.748$ $PTA = 18.021$ $PSA = 15.088$ $TEMP = 88.888$ $SN/L = 1.842 \cdot E5$

AVERAGED CHAMBER PARAMETERS

$PTC = 364.8$ $PTC/PSA = 24.2$

AVERAGED NOZZLE PARAMETERS

$PTC/P1 = 46.7$ $PTC/P2 = 35.3$ $PTC/P3 = 27.4$

AVERAGED BASE PRESSURES

$P4/PSA = .886$ $P5/PSA = .885$ $P6/PSA = .886$

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	.994	10	1.042
8	1.020	11	1.031
9	1.042	12	1.024

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TEST FA-19,FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 29/ 0

WIND TUNNEL TEST CONDITIONS

M = .53 Q = 2.739 PTA =18.022 PSA =15.101 TEMP = 80.888 RN/L = 1.835 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 460.8 [REDACTED] [REDACTED] PTC/PSA = 30.5

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 46.4 PTC/P2 = 35.1 PTC/P3 = 27.4

AVERAGED BASE PRESSURES

P4/PSA = .89% P5/PSA = .893 P6/PSA = .894

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	.995	10	1.042
8	1.021	11	1.032
9	1.042	12	1.024

TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 29/ 0

WIND TUNNEL TEST CONDITIONS

$M = .51$ $Q = 2.725$ $PTA = 18.022$ $PSA = 15.116$ $TEMP = 88.888$ $RN/L = 1.825 \times E5$

AVERAGED CHAMBER PARAMETERS

$PTC = 572.9$ $PTC/PSA = 37.9$

AVERAGED NOZZLE PARAMETERS

$PTC/P1 = 45.5$ $PTC/P2 = 34.6$ $PTC/P3 = 27.0$

AVERAGED BASE PRESSURES

$P4/PSA = .907$ $P5/PSA = .906$ $P6/PSA = .906$

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.000	10	1.044
8	1.024	11	1.034
9	1.045	12	1.026

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WIND TUNNEL TEST CONDITIONS

 $M = .52$ $Q = 2.718$ $PTA = 18.024$ $PSA = 15.127$ $TEMP = 88.888$ $RN/L = 1.820 \times E5$

AVERAGED CHAMBER PARAMETERS

 $PTC = 744.4$ $PTC/PSA = 49.2$

AVERAGED NOZZLE PARAMETERS

 $PTC/P1 = 45.5$ $PTC/P2 = 34.6$ $PTC/P3 = 27.2$

AVERAGED BASE PRESSURES

 $P4/PSA = .920$ $P5/PSA = .919$ $P6/PSA = .920$

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.005	10	1.046
8	1.027	11	1.036
9	1.046	12	1.028

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TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 31/ 8

WIND TUNNEL TEST CONDITIONS

$M = 3.48$ $Q = 5.703$ $PTA = 49.879$ $PSA = .672$ $TEMP = 88.888$ $RN/L = 20.542 \times E5$

AVERAGED CHAMBER PARAMETERS

$PTC = .4$ $PTC/PSA = .6$

AVERAGED NOZZLE PARAMETERS

$PTC/P1 = 3.7$ $PTC/P2 = 4.2$ $PTC/P3 = 3.1$

AVERAGED BASE PRESSURES

$P4/PSA = .315$ $P5/PSA = .280$ $P6/PSA = .264$

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	3.104	10	1.239
8	2.751	11	.931
9	2.451	12	.930

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TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL, HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 31/ 1

WIND TUNNEL TEST CONDITIONS

M = 3.48 Q = 5.706 PTA = 49.905 PSA = .673 TEMP = 88.888 RN/L = 20.564 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 1047.5 [REDACTED] [REDACTED] PTC/PSA = 1556.5

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 45.9 PTC/P2 = 35.1 PTC/P3 = 27.7

AVERAGED BASE PRESSURES

P4/PSA = 1.320 P5/PSA = 1.241 P6/PSA = 1.313

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	3.109	10	1.328
8	2.683	11	1.042
9	2.306	12	.942

TEST FA-19.FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 32/ 1

WIND TUNNEL TEST CONDITIONS

M = 3.48 Q = 5.705 P1A = 49.900 PSA = .673 TEMP = 88.888 RN/L = 20.573 • E5

AVERAGED CHAMBER PARAMETERS

PTC = 1253.6 [REDACTED] PTC/PSA = 1882.7

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 45.9 PTC/P2 = 35.2 PTC/P3 = 27.8

AVERAGED BASE PRESSURES

P4/PSA = 1.407 P5/PSA = 1.322 P6/PSA = 1.398

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	3.316	10	1.324
8	2.706	11	1.040
9	2.323	12	.942

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TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 33/ 1

WIND TUNNEL TEST CONDITIONS

M = 3.48 Q = 5.705 PTA = 49.900 PSA = .673 TEMP = 88.888 RN/L = 20.574 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 492.5 [REDACTED] [REDACTED] PTC/PSA = 731.8

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 46.2 PTC/P2 = 35.2 PTC/P3 = 27.4

AVERAGED BASE PRESSURES

P4/PSA = 1.031 P5/PSA = .949 P6/PSA = 1.011

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	3.238	10	1.317
8	2.670	11	1.013
9	2.314	12	.936

TEST FA-19,FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 34/ 0

WIND TUNNEL TEST CONDITIONS

M = 3.48 Q = 5.705 PTA = 49.901 PSA = .673 TEMP = 88.888 RN/L = 20.566 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 219.5 [REDACTED] PTC/PSA = 326.2

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 47.5 PTC/P2 = 36.1 PTC/P3 = 27.8

AVERAGED BASE PRESSURES

P4/PSA = .756 P5/PSA = .697 P6/PSA = .725

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	3.262	10	1.294
8	2.691	11	.992
9	2.346	12	.932

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TEST FA-19,FE9. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 35/ 0

WIND TUNNEL TEST CONDITIONS

M = .00 Q = 1.000 PTA = 1.945 PSA = 14.479 TEMP = -88.888 RN/L = 89.549 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 1275.8 [REDACTED] PTC/PSA = 88.1

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 45.8 PTC/P2 = 35.2 PTC/P3 = 27.8

AVERAGED BASE PRESSURES

P4/PSA = .029 P5/PSA = .021 P6/PSA = .020

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	.073	10	.024
8	.044	11	.026
9	.033	12	.022

TEST FA-19,FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 36/ 0

WIND TUNNEL TEST CONDITIONS

M = .00 Q = 1.000 PTA = 1.928 PSA = 14.475 TEMP = -88.888 RN/L = 90.253 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 827.4 [REDACTED] PTC/PSA = 57.2

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 45.8 PTC/P2 = 35.0 PTC/P3 = 27.5

AVERAGED BASE PRESSURES

P4/PSA = .026 P5/PSA = .024 P6/PSA = .023

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	.091	10	.024
8	.043	11	.027
9	.031	12	.024

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TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 37/ 0

WIND TUNNEL TEST CONDITIONS

M = .00 Q = 1.000 PTA = 1.926 PSA = 14.473 TEMP = -88.888 RN/L = 90.430 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 412.3 [REDACTED] PTC/PSA = 28.5

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 46.5 PTC/P2 = 35.3 PTC/P3 = 27.5

AVERAGED BASE PRESSURES

P4/PSA = .027 P5/PSA = .026 P6/PSA = .026

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	.088	10	.026
8	.041	11	.029
9	.032	12	.026

TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL, HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 43/ 0

WIND TUNNEL TEST CONDITIONS

$M = 3.48$ $Q = 5.719$ $PTA = 50.023$ $PSA = .674$ $TEMP = 88.888$ $RN/L = 20.586 \cdot ES$

AVERAGED CHAMBER PARAMETERS

$PTC = 1349.3$ $PTC/PSA = 2001.9$

AVERAGED NOZZLE PARAMETERS

$PTC/P1 = 46.3$ $PTC/P2 = 35.3$ $PTC/P3 = 28.0$

AVERAGED BASE PRESSURES

$P4/PSA = 1.388$ $P5/PSA = 1.326$ $P6/PSA = 1.368$

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.854	10	1.183
8	1.820		
9	1.650	12	1.130

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TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 44/ 0

WIND TUNNEL TEST CONDITIONS

M = 3.48 Q = 5.717 PTA = 50.008 PSA = .674 TEMP = 88.888 RN/L = 20.564 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 1048.0 [REDACTED] PTC/PSA = 1554.9

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 46.0 PTC/P2 = 35.1 PTC/P3 = 27.7

AVERAGED BASE PRESSURES

P4/PSA = 1.303 P5/PSA = 1.246 P6/PSA = 1.283

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.824	10	1.075
8	1.804	[REDACTED]	
9	1.581	12	1.045

TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 45/ 0

WIND TUNNEL TEST CONDITIONS

M = 3.48 Q = 5.719 PTA = 50.018 PSA = .674 TEMP = 88.888 RN/L = 20.567 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 513.2 [REDACTED] PTC/PSA = 761.4

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 46.4 PTC/P2 = 35.1 PTC/P3 = 27.5

AVERAGED BASE PRESSURES

P4/PSA = 1.029 P5/PSA = .983 P6/PSA = 1.002

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.811	10	1.054
8	1.791	[REDACTED]	
9	1.583	12	1.030

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TEST FA-19,FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 46/ 0

WIND TUNNEL TEST CONDITIONS

M = 3.48 Q = 5.718 PTA = 50.015 PSA = .674 TEMP = 88.888 RN/I = 20.564 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 213.2 [REDACTED] PTC/PSA = 316.3

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 47.7 PTC/P2 = 36.0 PTC/P3 = 27.8

AVERAGED BASE PRESSURES

P4/PSA = .761 P5/PSA = .731 P6/PSA = .725

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.804	10	1.017
8	1.789	[REDACTED]	
9	1.581	12	1.008

WIND TUNNEL TEST CONDITIONS

 $M = 3.48$ $Q = 5.718$ $PTA = 50.012$ $PSA = .674$ $TEMP = 89.888$ $RN/L = 20.563 \times 55$

AVERAGED CHAMBER PARAMETERS

 $PTC = .2$ [REDACTED] $PTC/PSA = .3$

AVERAGED NOZZLE PARAMETERS

 $PTC/P1 = 2.7$ $PTC/P2 = 3.0$ $PTC/P3 = 2.2$

AVERAGED BASE PRESSURES

 $P4/PSA = .283$ $P5/PSA = .272$ $P6/PSA = .238$

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.804	10	.955
8	1.793	[REDACTED]	
9	1.601	12	.969

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TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 47/ 9

WIND TUNNEL TEST CONDITIONS

$M = .51$ $Q = 2.750$ $PTA = 18.072$ $PSA = 15.138$ $TEMP = 97.628$ $RN/L = 1.859 \times 10^5$

AVERAGED CHAMBER PARAMETERS

$PTC = 14.5$ [REDACTED] $PTC/PSA = 1.0$

AVERAGED NOZZLE PARAMETERS

$PTC/P1 = 1.0$ $PTC/P2 = 1.0$ $PTC/P3 = .9$

AVERAGED BASE PRESSURES

$P4/PSA = .954$ $P5/PSA = .952$ $P6/PSA = .953$

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	.981	10	1.027
8	1.006	[REDACTED]	
9	1.027	12	1.005

TEST FA-19.FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 47/ 1

WIND TUNNEL TEST CONDITIONS

M = .51 Q = 2.720 PTA = 18.076 PSA = 15.177 TEMP = 97.68° RN/L = 1.837 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 756.9 [REDACTED] PTC/PSA = 49.9

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 46.0 PTC/P2 = 35.0 PTC/P3 = 27.5

AVERAGED BASE PRESSURES

P4/PSA = .943 P5/PSA = .942 P6/PSA = .942

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	.977	10	1.025
8	1.004	[REDACTED]	
9	1.026	12	1.006

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TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 48/ 0

WIND TUNNEL TEST CONDITIONS

M = .51 Q = 2.715 PTA = 18.070 PSA = 15.176 TEMP = 98.258 RN/L = 1.832 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 592.5 [REDACTED] PTC/PSA = 39.0

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 46.2 PTC/P2 = 35.0 PTC/P3 = 27.5

AVERAGED BASE PRESSURES

P4/PSA = .932 P5/PSA = .931 P6/PSA = .931

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	.972	10	1.024
8	1.002	[REDACTED]	
9	1.024	12	1.005

TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 49/ 0

WIND TUNNEL TEST CONDITIONS

$M = .50$ $Q = 2.710$ $PTA = 19.071$ $PSA = 15.183$ $TEMP = 98.015$ $RN/L = 1.829 \times E5$

AVERAGED CHAMBER PARAMETERS

$PTC = 461.3$ [REDACTED] $PTC/PSA = 30.4$

AVERAGED NOZZLE PARAMETERS

$PTC/P1 = 46.5$ $PTC/P2 = 35.2$ $PTC/P3 = 27.5$

AVERAGED BASE PRESSURES

$P4/PSA = .921$ $P5/PSA = .920$ $P6/PSA = .921$

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	.968	10	1.023
8	1.000	[REDACTED]	
9	1.023	12	1.004

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WIND TUNNEL TEST CONDITIONS

 $M = .51$ $Q = 2.707$ $PTA = 18.071$ $PSA = 15.186$ $TEMP = 99.113$ $RN/L = 1.822 * E5$

AVERAGED CHAMBER PARAMETERS

 $PTC = 369.0$ [REDACTED] $PTC/PSA = 24.3$

AVERAGED NOZZLE PARAMETERS

 $PTC/P1 = 46.8$ $PTC/P2 = 35.3$ $PTC/P3 = 27.5$

AVERAGED BASE PRESSURES

 $P4/PSA = .913$ $P5/PSA = .912$ $P6/PSA = .913$

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	.965	10	1.023
8	.999	[REDACTED]	
9	1.023	12	1.004

WIND TUNNEL TEST CONDITIONS

 $M = .90$ $Q = 6.046$ $PTA = 18.075$ $PSA = 10.708$ $TEMP = 92.939$ $RN/L = 4.702 \times E5$

AVERAGED CHAMBER PARAMETERS

 $PTC = 335.3$ [REDACTED] $PTC/PSA = 31.3$

AVERAGED NOZZLE PARAMETERS

 $PTC/P1 = 46.9$ $PTC/P2 = 35.4$ $PTC/P3 = 27.6$

AVERAGED BASE PRESSURES

 $P4/PSA = .745$ $P5/PSA = .739$ $P6/PSA = .739$

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	.953	10	1.109
8	1.050	[REDACTED]	
9	1.117	12	1.031

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WIND TUNNEL TEST CONDITIONS

 $M = .90$ $Q = 6.034$ $PTA = 18.073$ $PSA = 10.726$ $TEMP = 97.600$ $RN/L = 4.638 \cdot E5$

AVERAGED CHAMBER PARAMETERS

 $PTC = 440.7$ [REDACTED] $PTC/PSA = 41.1$

AVERAGED NOZZLE PARAMETERS

 $PTC/P1 = 46.5$ $PTC/P2 = 35.1$ $PTC/P3 = 27.4$

AVERAGED BASE PRESSURES

 $P4/PSA = .803$ $P5/PSA = .798$ $P6/PSA = .798$

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	.981	10	1.112
8	1.053	[REDACTED]	
9	1.121	12	1.032

WIND TUNNEL TEST CONDITIONS

M = .90 Q = 6.034 PTA = 18.071 PSA = 10.724 TEMP = 97.818 RN/L = 4.636 • E5

AVERAGED CHAMBER PARAMETERS

PTC = 633.1 [REDACTED] PTC/PSA = 59.0

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 46.0 PTC/P2 = 35.0 PTC/P3 = 27.4

AVERAGED BASE PRESSURES

P4/PSA = .881 P5/PSA = .877 P6/PSA = .877

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	.993	10	1.117
8	1.064	11	[REDACTED]
9	1.126	12	1.038

TEST FA-19, FEB. - MAY 1977 -

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 54/ 0

WIND TUNNEL TEST CONDITIONS

M = .90 Q = 5.030 PTA = 18.085 PSA = 10.725 TEMP = 98.041 RN/L = 4.629 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 879.7 [REDACTED] PTC/PSA = 82.0

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 46.0 PTC/P2 = 35.0 PTC/P3 = 27.6

AVERAGED BASE PRESSURES

P4/PSA = .945 P5/PSA = .942 P6/PSA = .942

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.013	10	1.123
8	1.078	[REDACTED]	
9	1.134	12	1.044

WIND TUNNEL TEST CONDITIONS

 $M = 1.20$ $Q = 7.509$ $PTA = 18.065$ $PSA = 7.452$ $TEMP = 97.484$ $RN/L = 6.623 \cdot E5$

AVERAGED CHAMBER PARAMETERS

 $PTC = 6.0$ [REDACTED] $PTC/PSA = .8$

AVERAGED NOZZLE PARAMETERS

 $PTC/P1 = 1.1$ $PTC/P2 = 1.1$ $PTC/P3 = 1.0$

AVERAGED BASE PRESSURES

 $P4/PSA = .723$ $P5/PSA = .703$ $P6/PSA = .706$

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.178	10	1.269
8	1.280	[REDACTED]	
9	1.328	12	.994

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TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 55/ 0

WIND TUNNEL TEST CONDITIONS

$M = 1.20$ $Q = 7.510$ $PTA = 18.066$ $PSA = 7.445$ $TEMP = 97.909$ $RN/L = 6.620 \times E5$

AVERAGED CHAMBER PARAMETERS

$PTC = 1132.6$ [REDACTED] $PTC/PSA = 152.1$

AVERAGED NOZZLE PARAMETERS

$PTC/P1 = 46.1$ $PTC/P2 = 35.1$ $PTC/P3 = 27.8$

AVERAGED BASE PRESSURES

$P4/PSA = 1.088$ $P5/PSA = 1.073$ $P6/PSA = 1.085$

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.197	10	1.248
8	1.274	[REDACTED]	
9	1.304	12	1.003

TEST FA-19.FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 56/ 0

WIND TUNNEL TEST CONDITIONS

M = 1.20 Q = 7.503 PTA = 18.067 PSA = 7.472 TEMP = 88.480 RN/L = 6.596 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 720.9 [REDACTED] PTC/PSA = 96.5

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 48.0 PTC/P2 = 35.0 PTC/P3 = 27.5

AVERAGED BASE PRESSURES

P4/PSA = .931 P5/PSA = .915 P6/PSA = .922

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.176	10	1.249
8	1.269	[REDACTED]	
9	1.303	12	.998

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TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 57/ 0

WIND TUNNEL TEST CONDITIONS

M = 1.20 Q = 7.501 PTA = 19.066 PSA = 7.478 TEMP = 98.974 RN/L = 6.584 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 427.3 [REDACTED] PTC/PSA = 57.1

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 46.6 PTC/P2 = 35.3 PTC/P3 = 27.5

AVERAGED BASE PRESSURES

P4/PSA = .753 P5/PSA = .769 P6/PSA = .774

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.171	10	1.254
8	1.270	[REDACTED]	
9	1.308	12	.996

WIND TUNNEL TEST CONDITIONS

M = 1.20 Q = 7.503 PTA = 18.061 PSA = 7.459 TEMP = 99.068 RN/L = 6.591 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 274.2 [REDACTED] PTC/PSA = 36.8

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 47.3 PTC/P2 = 35.7 PTC/P3 = 27.6

AVERAGED BASE PRESSURES

P4/PSA = .672 P5/PSA = .659 P6/PSA = .660

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.173	10	1.258
8	1.273	[REDACTED]	
9	1.312	12	.996

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WIND TUNNEL TEST CONDITIONS

 $M = .90$ $Q = 6.073$ $PTA = 18.065$ $PSA = 10.652$ $TEMP = 98.122$ $RN/L = 4.674 \times E5$

AVERAGED CHAMBER PARAMETERS

 $PTC = 9.6$ $PTC/PSA = .9$

AVERAGED NOZZLE PARAMETERS

 $PTC/P1 = 1.0$ $PTC/P2 = 1.0$ $PTC/P3 = 1.0$

AVERAGED BASE PRESSURES

 $P4/PSA = .862$ $P5/PSA = .850$ $P6/PSA = .850$

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	.976	10	1.123
8	1.062		
9	1.131	12	1.036

TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONGUIESCENT PHASE

RUN 59/ 6

WIND TUNNEL TEST CONDITIONS

M = 1.47 Q = 8.629 PTA = 20.052 PSA = 5.731 TEMP = 99.029 RN/L = 8.731 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 4.2 [REDACTED] PTC/PSA = .7

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 1.0 PTC/P2 = 1.0 PTC/P3 = 1.0

AVERAGED BASE PRESSURES

P4/PSA = .551 P5/PSA = .527 P6/PSA = .514

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.317	10	1.183
8	1.370	[REDACTED]	
9	1.387	12	1.010

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TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 59/ 0

WIND TUNNEL TEST CONDITIONS

M = 1.47 Q = 8.631 PTA = 20.057 PSA = 5.731 TEMP = 98.316 RN/L = 8.749 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 1295.6 [REDACTED] PTC/PSA = 225.1

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 46.1 PTC/P2 = 35.2 PTC/P3 = 27.9

AVERAGED BASE PRESSURES

P4/PSA = 1.149 P5/PSA = 1.128 P6/PSA = 1.134

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.313	10	1.216
8	1.351	[REDACTED]	
9	1.359	12	1.008

TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL, HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 60/ 0

WIND TUNNEL TEST CONDITIONS

$M = 1.47$ $Q = 8.627$ $PTA = 20.042$ $PSA = 5.764$ $TEMP = 98.383$ $RN/L = 8.722 \times E5$

AVERAGED CHAMBER PARAMETERS

$PTC = 798.2$ [REDACTED] $PTC/PSA = 138.5$

AVERAGED NOZZLE PARAMETERS

$PTC/P1 = 46.0$ $PTC/P2 = 35.0$ $PTC/P3 = 27.5$

AVERAGED BASE PRESSURES

$P4/PSA = 1.004$ $P5/PSA = .979$ $P6/PSA = .985$

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.300	10	1.213
8	1.348	[REDACTED]	
9	1.356	12	1.005

CP

TEST FA-19, FEB. - MAY 1977

HSFC TRISONIC WIND TUNNEL, HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 61/ 1

WIND TUNNEL TEST CONDITIONS

M = 1.47 Q = 8.620 PTA = 20.038 PSA = 5.696 TEMP = 98.159 RN/L = 8.765 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 441.5 [REDACTED] PTC/PSA = 77.6

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 46.5 PTC/P2 = 35.2 PTC/P3 = 27.5

AVERAGED BASE PRESSURES

P4/PSA = .852 P5/PSA = .825 P6/PSA = .828

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.312	10	1.220
8	1.353	[REDACTED]	
9	1.365	12	.984

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TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 62/ 0

WIND TUNNEL TEST CONDITIONS

$M = 1.47$ $Q = 8.625$ $PTA = 20.043$ $PSA = 5.727$ $TEMP = 99.141$ $RN/L = 8.726 \cdot E5$

AVERAGED CHAMBER PARAMETERS

$PTC = 254.6$ [REDACTED] $PTC/PSA = 44.5$

AVERAGED NOZZLE PARAMETERS

$PTC/P1 = 47.4$ $PTC/P2 = 35.7$ $PTC/P3 = 27.7$

AVERAGED BASE PRESSURES

$P4/PSA = .712$ $P5/PSA = .683$ $P6/PSA = .676$

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.311	10	1.207
8	1.361	[REDACTED]	
9	1.373	12	1.008

TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 63/ 8

WIND TUNNEL TEST CONDITIONS

$M = 1.98$ $Q = 10.268$ $PTA = 28.066$ $PSA = 3.820$ $TEMP = 98.508$ $RN/L = 13.939 \cdot E5$

AVERAGED CHAMBER PARAMETERS

$PTC = 2.3$ [REDACTED] $PTC/PSA = .6$

AVERAGED NOZZLE PARAMETERS

$PTC/P1 = 1.0$ $PTC/P2 = 1.0$ $PTC/P3 = 1.0$

AVERAGED BASE PRESSURES

$P4/PSA = .455$ $P5/PSA = .441$ $P6/PSA = .419$

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.450	10	.947
8	1.446	[REDACTED]	
9	1.463	12	.927

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TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 63/ 0

WIND TUNNEL TEST CONDITIONS

M = 1.98 Q = 10.243 PTA = 28.030 PSA = 3.804 TEMP = 89.888 RN/L = 13.845 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 224.9 [REDACTED] PTC/PSA = 59.1

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 47.6 PTC/P2 = 35.8 PTC/P3 = 27.7

AVERAGED BASE PRESSURES

P4/PSA = .673 P5/PSA = .636 P6/PSA = .637

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.455	10	.969
8	1.445	[REDACTED]	
9	1.454	12	.926

TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 64/ 0

WIND TUNNEL TEST CONDITIONS

M = 1.95 Q = 10.250 PTA = 28.024 PSA = 3.824 TEMP = 88.888 RN/L = 13.835 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 395.0 [REDACTED] PTC/PSA = 103.3

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 44.7 PTC/P2 = 34.0 PTC/P3 = 26.6

AVERAGED BASE PRESSURES

P4/PSA = .814 P5/PSA = .780 P6/PSA = .783

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.455	10	.978
8	1.444	[REDACTED]	
9	1.448	12	.931

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TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 65/ 0

WIND TUNNEL TEST CONDITIONS

$M = 1.95$ $Q = 10.270$ $PTA = 28.047$ $PSA = 3.829$ $TEMP = 88.888$ $RN/L = 13.843 \times E5$

AVERAGED CHAMBER PARAMETERS

$PTC = 678.6$ [REDACTED] $PTC/PSA = 177.2$

AVERAGED NOZZLE PARAMETERS

$PTC/P1 = 46.0$ $PTC/P2 = 34.9$ $PTC/P3 = 27.4$

AVERAGED BASE PRESSURES

$P4/PSA = .852$ $P5/PSA = .915$ $P6/PSA = .920$

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.456	10	.987
8	1.441	[REDACTED]	
9	1.443	12	.931

TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 66/ 0

WIND TUNNEL TEST CONDITIONS

M = 1.96 Q = 10.249 PTA = 28.044 PSA = 3.806 TEMP = 88.888 RN/L = 13.863 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 1350.7 [REDACTED] PTC/PSA = 354.9

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 46.2 PTC/P2 = 35.3 PTC/P3 = 28.0

AVERAGED BASE PRESSURES

P4/PSA = 1.156 P5/PSA = 1.114 P6/PSA = 1.125

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.468	10	.996
8	1.449	[REDACTED]	
9	1.445	12	.937

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TEST FA-19.FEB. - MAY 1977

NSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 88/ 2

WIND TUNNEL TEST CONDITIONS

M = 1.97 Q = 10.196 PTA = 28.013 PSA = 3.757 TEMP = 98.734 RN/L = 13.916 • E5

AVERAGED CHAMBER PARAMETERS

PTC = 706.4 [REDACTED] TC = 410.5 PTC/PSA = 188.0

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 45.0 PTC/P2 = 34.1 PTC/P3 = 22.1

AVERAGED BASE PRESSURES

P4/PSA = .759 P5/PSA = .718 P6/PSA = .748

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.418	10	.981
8	1.416	[REDACTED]	
9	1.439	12	.964

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TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 69/ 1

WIND TUNNEL TEST CONDITIONS

M = 1.68 Q = 10.257 PTA = 28.038 PSA = 3.817 TEMP = 99.156 RN/L = 13.901 • E5

AVERAGED CHAMBER PARAMETERS

PTC = 1132.9 [REDACTED] TC = 471.9 PTC/PSA = 296.8

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 43.3 PTC/P2 = 33.0 PTC/P3 = 19.9

AVERAGED BASE PRESSURES

P4/PSA = .906 P5/PSA = .865 P6/PSA = .900

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.419	10	.984
8	1.412	[REDACTED]	
9	1.432	12	.960

TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 90/ 0

WIND TUNNEL TEST CONDITIONS

M = 1.95 Q = 7.628 PTA = 23.282 PSA = 6.328 TEMP = 98.281 RN/L = 9.781 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 1521.8 [REDACTED] TC = 511.8 PTC/PSA = 240.5

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 44.1 PTC/P2 = 33.5 PTC/P3 = 19.6

AVERAGED BASE PRESSURES

P4/PSA = .618 P5/PSA = .591 P6/PSA = .610

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	.862	10	.604
8	.859	[REDACTED]	
9	.866	12	.585

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TEST FA-19.FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 91/ 0

WIND TUNNEL TEST CONDITIONS

M = 1.97 Q = 6.999 PTA = 23.446 PSA = 7.081 TEMP = 99.445 RN/L = 8.338 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 480.2 [REDACTED] TC = 367.4 PTC/PSA = 65.0

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 45.7 PTC/P2 = 34.4 PTC/P3 = 20.3

AVERAGED BASE PRESSURES

P4/PSA = .346 P5/PSA = .326 P6/PSA = .335

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	.755	10	.526
8	.753	[REDACTED]	
9	.766	12	.516

TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 92/ 0

WIND TUNNEL TEST CONDITIONS

M = 1.47 Q = 8.621 PTA = 20.030 PSA = 5.748 TEMP = 99.952 RN/L = 0.690 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 450.6 [REDACTED] TC = 368.0 PTC/PSA = 78.4

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 46.0 PTC/P2 = 34.5 PTC/P3 = 21.3

AVERAGED BASE PRESSURES

P4/PSA = .671 P5/PSA = .641 P6/PSA = .656

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.291	10	1.219
8	1.348	[REDACTED]	
9	1.366	12	1.017

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TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 93/ 0

WIND TUNNEL TEST CONDITIONS

$M = 1.47$ $Q = 6.943$ $PTA = 17.754$ $PSA = 6.782$ $TEMP = 88.888$ $RN/L = 6.686 \times E5$

AVERAGED CHAMBER PARAMETERS

$PTC = 674.7$ $TC = 423.8$ $PTC/PSA = 99.5$

AVERAGED NOZZLE PARAMETERS

$PTC/P1 = 42.9$ $PTC/P2 = 32.5$ $PTC/P3 = 18.9$

AVERAGED BASE PRESSURES

$P4/PSA = .660$ $P5/PSA = .638$ $P6/PSA = .651$

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.089	10	1.029
8	1.123		
9	1.141	12	.814

TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 94/ 1

WIND TUNNEL TEST CONDITIONS

M = 1.45 Q = 8.624 PTA = 20.025 PSA = 5.811 TEMP = 88.888 RN/L = 8.619 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 1056.2 [REDACTED] TC = 495.9 PTC/PSA = 181.8

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 43.9 PTC/P2 = 33.5 PTC/P3 = 18.6

AVERAGED BASE PRESSURES

P4/PSA = .924 P5/PSA = .903 P6/PSA = .915

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.286	10	1.232
8	1.334	[REDACTED]	
9	1.351	12	.997

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TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 95/ 0

WIND TUNNEL TEST CONDITIONS

M = 1.45 Q = 8.532 PTA = 20.039 PSA = 5.873 TEMP = 88.888 RN/L = 8.596 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 1568.3 [REDACTED] TC = 494.0 PTC/PSA = 267.0

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 44.0 PTC/P2 = 33.5 PTC/P3 = 21.1

AVERAGED BASE PRESSURES

P4/PSA = 1.045 P5/PSA = 1.027 P6/PSA = 1.034

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.291	10	1.224
8	1.336	[REDACTED]	
9	1.354	12	.977

TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 96/ 0

WIND TUNNEL TEST CONDITIONS

M = 1.18 Q = 7.546 PTA = 13.175 PSA = 7.523 TEMP = 88.888 RN/L = 6.606 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 478.0 [REDACTED] TC = 360.9 PTC/PSA = 63.5

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 43.8 PTC/P2 = 33.1 PTC/P3 = 20.3

AVERAGED BASE PRESSURES

P4/PSA = .645 P5/PSA = .632 P6/PSA = .642

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.165	10	1.259
8	1.267	[REDACTED]	
9	1.313	12	1.006

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TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 97/ 0

WIND TUNNEL TEST CONDITIONS

M = 1.19 Q = 7.533 PTA = 18.154 PSA = 7.528 TEMP = 88.888 RN/L = 6.581 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 708.2 [REDACTED] TC = 426.3 PTC/PSA = 94.1

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 44.9 PTC/P2 = 34.0 PTC/P3 = 20.5

AVERAGED BASE PRESSURES

P4/PSA = .757 P5/PSA = .745 P6/PSA = .757

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.162	10	1.272
8	1.263	[REDACTED]	
9	1.311	12	1.016

TEST FA-19,FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 98/ 0

WIND TUNNEL TEST CONDITIONS

M = 1.19 Q = 7.530 PTA = 18.152 PSA = 7.537 TEMP = 88.888 RN/L = 6.579 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 983.2 [REDACTED] TC = 467.4 PTC/PSA = 130.4

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 43.2 PTC/P2 = 32.9 PTC/P3 = 19.0

AVERAGED BASE PRESSURES

P4/PSA = .860 P5/PSA = .844 P6/PSA = .881

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.162	10	1.262
8	1.262	[REDACTED]	
9	1.300	12	1.007

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TEST FA-19,FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 99/ 1

WIND TUNNEL TEST CONDITIONS

M = 1.20 Q = 7.533 PTA = 18.151 PSA = 7.523 TEMP = 98.688 RN/L = 6.585 * ES

AVERAGED CHAMBER PARAMETERS

PTC = 1440.2 [REDACTED] TC = 517.6 PTC/PSA = 191.4

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 43.8 PTC/P2 = 33.4 PTC/P3 = 18.7

AVERAGED BASE PRESSURES

P4/PSA = 1.009 P5/PSA = .995 P6/PSA = 1.013

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	FSM/PSA
7	1.170	10	1.256
8	1.262	[REDACTED]	
9	1.298	12	1.009

TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 100/ 0

WIND TUNNEL TEST CONDITIONS

M = .89 Q = 8.116 PTA = 18.168 PSA = 10.699 TEMP = 88.898 RN/L = 4.671 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 1388.1 [REDACTED] TC = 517.1 PTC/PSA = 129.7

AVERAGED NOZZLE PARAMETERS

P1./P1 = 43.7 PTC/P2 = 33.3 PTC/P3 = 18.6

AVERAGED BASE PRESSURES

P4/PSA = .956 P5/PSA = .956 P6/PSA = .957

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.020	10	1.135
8	1.086	[REDACTED]	
9	1.142	12	1.054

TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL, HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 101/ 0

WIND TUNNEL TEST CONDITIONS

$M = .90$ $Q = 6.091$ $PTA = 18.154$ $PSA = 10.725$ $TEMP = 88.838$ $RN/L = 4.651 \cdot E5$

AVERAGED CHAMBER PARAMETERS

$PTC = 1005.4$ $TC = 486.3$ $PTC/PSA = 93.7$

AVERAGED NOZZLE PARAMETERS

$PTC/P1 = 44.0$ $PTC/P2 = 33.5$ $PTC/P3 = 19.7$

AVERAGED BASE PRESSURES

$P4/PSA = .879$ $P5/PSA = .880$ $P6/PSA = .881$

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	.993	10	1.124
8	1.066		
9	1.130	12	1.044

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TEST FA-19.FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 102/ 0

WIND TUNNEL TEST CONDITIONS

M = .90 Q = 6.063 PTA = 18.115 PSA = 10.726 TEMP = 88.888 RN/L = 4.623 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 812.3 [REDACTED] TC = 466.6 PTC/PSA = 75.7

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 44.1 PTC/P2 = 33.5 PTC/P3 = 18.7

AVERAGED BASE PRESSURES

P4/PSA = .931 P5/PSA = .931 P6/PSA = .932

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	.966	10	1.119
8	1.056	[REDACTED]	
9	1.124	12	1.040

TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 103/ 0

WIND TUNNEL TEST CONDITIONS

M = .90 Q = 6.079 PTA = 19.115 PSA = 10.700 TEMP = 88.888 RN/L = 4.634 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 629.0 [REDACTED] TC = 439.4 PTC/PSA = 59.7

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 42.6 PTC/P2 = 32.2 PTC/P3 = 18.1

AVERAGED BASE PRESSURES

P4/PSA = .775 P5/PSA = .774 P6/PSA = .775

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	.957	10	1.120
8	1.053	[REDACTED]	
9	1.124	12	1.039

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TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 1047 0

WIND TUNNEL TEST CONDITIONS

M = .50 Q = 2.735 PTA = 18.143 PSA = 15.228 TEMP = 88.888 RN/L = 1.831 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 717.1 [REDACTED] TC = 435.6 PTC/PSA = 47.1

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 44.4 PTC/P2 = 33.7 PTC/P3 = 18.9

AVERAGED BASE PRESSURES

P4/PSA = .921 P5/PSA = .922 P6/PSA = .922

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	.970	10	1.024
8	1.001	[REDACTED]	
9	1.026	12	1.004

TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 105/ 0

WIND TUNNEL TEST CONDITIONS

M = .50 Q = 2.732 PTA = 18.13+ PSA = 15.222 TEMP = 88.888 RN/L = 1.829 • E5

AVERAGED CHAMBER PARAMETERS

PTC = 899.8 [REDACTED] TC = 468.7 PTC/PSA = 59.1

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 44.0 PTC/P2 = 33.5 PTC/P3 = 18.6

AVERAGED BASE PRESSURES

P4/PSA = .933 P5/PSA = .933 P6/PSA = .933

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	.975	10	1.025
8	1.004	[REDACTED]	
9	1.027	12	1.005

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TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 106/ 0

WIND TUNNEL TEST CONDITIONS

M = .50 Q = 2.709 PTA = 18.122 PSA = 15.236 TEMP = 88.888 RN/L = 1.813 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 1130.9 [REDACTED] TC = 484.9 PTC/PSA = 74.2

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 43.8 PTC/P2 = 33.5 PTC/P3 = 18.8

AVERAGED BASE PRESSURES

P4/PSA = .945 P5/PSA = .945 P6/PSA = .945

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	.981	10	1.026
8	1.007	[REDACTED]	
9	1.029	12	1.007

TEST FA-19,FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 107/ 0

WIND TUNNEL TEST CONDITIONS

M = .50 Q = 2.719 PTA = 16.130 PSA = 15.233 TEMP = 88.888 RN/L = 1.819 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 1323.6 [REDACTED] TC = 501.8 PTC/PSA = 86.9

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 42.8 PTC/P2 = 32.6 PTC/P3 = 18.3

AVERAGED BASE PRESSURES

P4/PSA = .953 P5/PSA = .953 P6/PSA = .953

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	.984	10	1.027
8	1.009	[REDACTED]	
9	1.030	12	1.007

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TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL, HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 109/ 1

WIND TUNNEL TEST CONDITIONS

M = 3.48 Q = 5.702 PTA = 49.675 PSA = .672 TEMP = 80.888 RN/L = 20.492 • E5

AVERAGED CHAMBER PARAMETERS

PTC = 204.4 [REDACTED] TC = 308.1 PTC/PSA = 304.2

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 44.6 PTC/P2 = 33.6 PTC/P3 = 19.8

AVERAGED BASE PRESSURES

P4/PSA = .599 P5/PSA = .571 P6/PSA = .581

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.835	10	1.129
8	1.777	[REDACTED]	
9	1.623	12	1.110

TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 109/ 0

WIND TUNNEL TEST CONDITIONS

M = 3.48 Q = 5.703 PTA = 49.880 PSA = .672 TEMP = 88.888 RN/L = 20.489 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 466.2 [REDACTED] TC = 391.9 PTC/PSA = 693.7

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 45.6 PTC/P2 = 34.3 PTC/P3 = 20.3

AVERAGED BASE PRESSURES

P4/PSA = .804 P0/PSA = .777 P6/PSA = .817

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.835	10	1.110
8	1.781	[REDACTED]	
9	1.608	12	1.091

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TEST FA-19, FEB. - MAY 1977

MSFC TRANSONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 110/ 0

WIND TUNNEL TEST CONDITIONS

M = 3.48 Q = 5.702 PTA = 49.858 PSA = .672 TEMP = 101.810 RN/L = 20.491 * ES

AVERAGED CHAMBER PARAMETERS

PTC = 789.9 [REDACTED] TC = 462.4 PTC/PSA = 1190.3

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 44.4 PTC/P2 = 33.6 PTC/P3 = 19.1

AVERAGED BASE PRESSURES

P4/PSA = 1.084 P5/PSA = 1.048 P6/PSA = 1.096

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.851	10	1.224
8	1.782	[REDACTED]	
9	1.648	12	1.191

TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 1117 0

WIND TUNNEL TEST CONDITIONS

M = 3.48 Q = 5.703 PTA = 49.882 PSA = .672 TEMP = 88.888 RN/L = 20.501 • E5

AVERAGED CHAMBER PARAMETERS

PTC = 1425.1 [REDACTED] TC = 513.4 PTC/PSA = 2122.2

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 43.9 PTC/P2 = 33.4 PTC/P3 = 19.2

AVERAGED BASE PRESSURES

P4/PSA = 1.385 P5/PSA = 1.355 P6/PSA = 1.407

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.880	10	1.333
8	1.817	[REDACTED]	
9	1.699	12	1.296

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TEST FA-19.FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL, HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 111/ 9

WIND TUNNEL TEST CONDITIONS

M = 3.48 Q = 5.702 PTA = 49.872 PSA = .672 TEMP = 88.889 RN/L = 20.512 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 14.0 [REDACTED] TC = 42.8 PTC/PSA = 20.8

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 25.7 PTC/P2 = 21.7 PTC/P3 = 4.4

AVERAGED BASE PRESSURES

P4/PSA = .422 P5/PSA = .372 P6/PSA = .350

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	1.831	10	1.141
8	1.770	[REDACTED]	
9	1.629	12	1.121

TEST FA-19,FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 112/ 0

WIND TUNNEL TEST CONDITIONS

M = .00 Q = 1.000 PTA = 1.937 PSA = 14.448 TEMP = -88.888 RN/L = 89.424 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 1235.1 [REDACTED] TC = 531.0 PTC/PSA = 85.5

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 42.8 PTC/P2 = 32.7 PTC/P3 = 18.1

AVERAGED BASE PRESSURES

P4/PSA = .038 P5/PSA = .031 P6/PSA = .031

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	.036	10	.042
8	.040	[REDACTED]	
9	.039	12	.041

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TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL, HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 113/ 0

WIND TUNNEL TEST CONDITIONS

M = .00 Q = 1.000 PTA = 1.918 PSA = 14.509 TEMP = -88.888 RN/L = 93.193 ° E5

AVERAGED CHAMBER PARAMETERS

PTC = 417.5 [REDACTED] TC = 392.1 PTC/PSA = 28.8

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 45.7 PTC/P2 = 34.3 PTC/P3 = 19.5

AVERAGED BASE PRESSURES

P4/PSA = .021 P5/PSA = .020 P6/PSA = .019

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	.022	10	.030
8	.028	[REDACTED]	
9	.028	12	.030

TEST FA-19.FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL, HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 114/ 1

WIND TUNNEL TEST CONDITIONS

M = .00 Q = 1.000 PTA = 1.915 PSA = 14.507 TEMP = -88.888 RN/L = 93.735 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 1547.3 [REDACTED] TC = 513.5 PTC/PSA = 106.7

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 44.3 PTC/P2 = 33.6 PTC/P3 = 19.7

AVERAGED BASE PRESSURES

P4/PSA = .024 P5/PSA = .021 P6/PSA = .029

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	.026	10	.035
8	.031	[REDACTED]	
9	.032	12	.035

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TEST FA-19,FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 116/ 0

WIND TUNNEL TEST CONDITIONS

M = .00 Q = 1.000 PTA = 1.945 PSA = 14.486 TEMP = -88.888 RN/L = 96.097 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 1186.1 [REDACTED] TC = 463.1 PTC/PSA = 81.9

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 82.1 PTC/P2 = 59.1 PTC/P3 = 29.2

AVERAGED BASE PRESSURES

P4/PSA = .019 P5/PSA = .017 P6/PSA = .015

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	.020	10	.032
8	.027	[REDACTED]	
9	.027	12	.031

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TEST FA-19, FEB. - MAY 1977

MSFC TRISONIC WIND TUNNEL, HUNTSVILLE, ALABAMA
NONQUIESCENT PHASE

RUN 117/ 0

WIND TUNNEL TEST CONDITIONS

M = .00 Q = 1.000 PTA = 1.940 PSA = 14.486 TEMP = -88.888 RN/L = 96.343 * E5

AVERAGED CHAMBER PARAMETERS

PTC = 394.2 [REDACTED] TC = 351.6 PTC/PSA = 27.2

AVERAGED NOZZLE PARAMETERS

PTC/P1 = 85.1 PTC/P2 = 60.5 PTC/P3 = 30.6

AVERAGED BASE PRESSURES

P4/PSA = .025 P5/PSA = .024 P6/PSA = .024

AVERAGED MODEL SURFACE PRESSURES

NO.	PSM/PSA	NO.	PSM/PSA
7	.025	10	.033
8	.032	[REDACTED]	
9	.030	12	.032